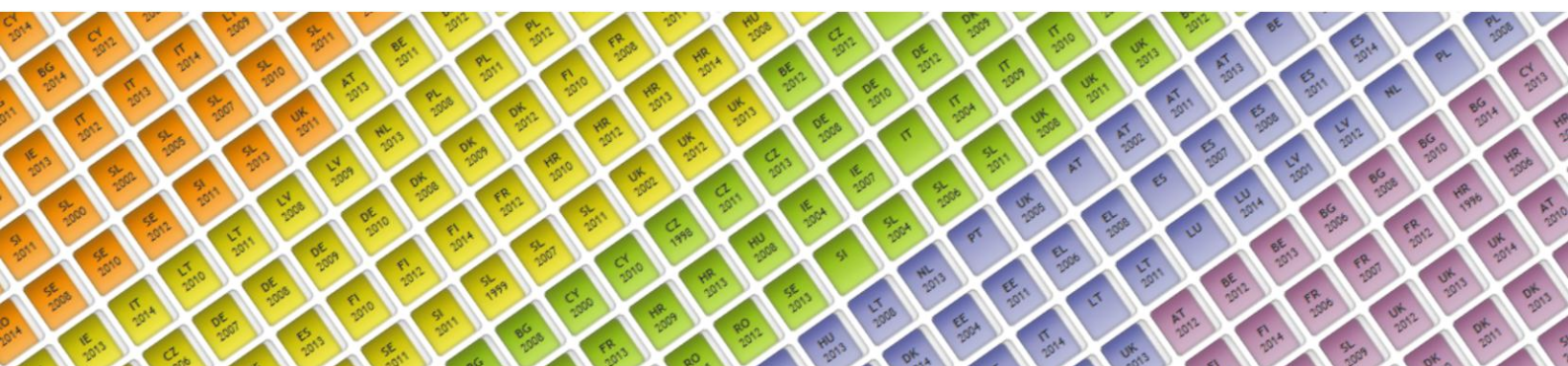




RIO Country Report

Spain 2014

2015



European Commission
Joint Research Centre
Institute for Prospective Technological Studies

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Abstract

The report offers an analysis of the R&I system in Spain for 2014, including relevant policies and funding, with particular focus on topics critical for two EU policies: the European Research Area and the Innovation Union. The report was prepared according to a set of guidelines for collecting and analysing a range of materials, including policy documents, statistics, evaluation reports, websites etc. The report identifies the structural challenges of the Spanish research and innovation system and assesses the match between the national priorities and those challenges, highlighting the latest policy developments, their dynamics and impact in the overall national context.

Acknowledgments

This analytical country report is the first of a series of annual RIO Country Reports. This Country Report builds on the series of ERAWATCH reports.

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Executive summary:

The financial crisis has severely hit the Spanish Research and Innovation (R&I) system, turning the positive trend seen over the pre-crisis period into a negative one. Spain doubled its Gross Expenditure on Research and Development (GERD) in absolute terms over the period 2002-2008, showing an increasing trend well above the EU-average. In relative terms, GERD as a percentage of Gross Domestic Product (GDP) increased from 0.96% in 2002 to 1.32% in 2008. It reached its highest level in 2009 (1.35%) and quickly declined over the following years, reaching in 2013 a figure similar to the one in 2007 (1.24% and 1.23%, respectively). Disinvestments in public budgets for R&D have been important after the financial crisis. Government Budget Appropriations or Outlays on R&D (GBAORD) reached their highest level in 2009 (€8,700m) and decreased by 39% until 2013, going back to the levels of 2005-2006. Some weak positive trends could be envisaged, however, using data on the central government's budget for public expenditures (PGE) to R&I for 2014 and 2015. After yearly decreases since 2009, which reached their lowest point in 2012 with a -25.6% yearly reduction, the levels had increased in 2014 and 2015 by 3.6% and 4.2%, respectively. Despite these growths, the budget for 2015 is lower than the one of 2006 (€6,546m) (ICONO-MINECO: 2014). These trends show a clear step backwards for the Spanish R&D system of at least 8 years in funding terms. In this post-crisis period, Spain has also set a lower R&I target of 2% GERD per GDP for 2020. It has to be noted that this R&D intensity target for 2020 is lower than the current European average (EU-28, 2.02) and falls short of the 3% target fixed for the EU as a whole in the Europe 2020 strategy. Nonetheless, progress towards reaching this lower target is negative, partly due to the important public budget cuts for R&I which were suffered in the post-crisis period. These actions indicate that governments, contrary to their formal discourse in support for science, have not seen R&I funding as investment and a mechanism to overcome the financial crisis, but mainly as expenditure.

These quick disinvestments in R&I threaten to set back the progress made over the pre-crisis period. Spain has become a "moderate innovator" with a strong human resources research base and good research performance levels (EC, 2012a; EC, 2013a; and EC, 2014b). Spanish researchers are publishing with other international peers much more frequently than their European peers are doing. They are also increasing the quality of their publications and the levels of co-publications with the private sector. This indicates that the efforts made on the research input side in the period 2002-2008 had positive results on the research output side and on the linkages with the private sector. If public funding for R&I has gone back to the levels of 2005-2006 in total terms, the decrease in relative terms has been even more important. The total funds per R&D personnel (Full-Time Equivalent - FTE) changed from €41.1k per head in 2009 to €22.6k per head (€16.2k non-financial) in 2013, much lower than the €31.9k of 2002 (Molero and de No, 2012b; Molero and de No, 2012c; Molero and de No, 2013a). In addition, the share of loans in the state public budget for R&I has been increasing, which implies, de facto, an even greater reduction. In 2013, an approximate 80% of the total reduction lay in non-financial funds (Molero and de No, 2012c, 2013a). This trend has been maintained despite the increases in the PGE for 2014 and 2015 (Molero and de No, 2014a and 2014b). In addition, the level of non-execution of yearly public national budgets for R&I has been important, with percentages ranging from 21% to 45% in the 2009-2013 period (Molero and de No,

2012a; FECYT, 2013a: 31). All these factors particularly affect basic research, which relies on public funds and subsidies, and, therefore, on the strong areas of the Spanish R&I system.

Spain has a quasi-federal decentralised system of governance. Regions (“Autonomous Communities”) have political and administrative responsibilities for research and innovation, and are in charge of university funding. They play an important role in research and innovation, as regional budgets represent 60% of the total GBAORD (ERAC, 2014). This decentralised R&I system poses some challenges to its governance (OECD, 2006; ERAC, 2014), requiring important national and regional coordination to improve synergies and reduce regional disparities in R&I. Some developments might improve the coordination of national and regional R&I policies: for example, the new Law of Science, Technology and Innovation (LCTI 2011), which is aimed at improving national and regional coordination through the Council of Science, Technology and Innovation (CPCTI). In addition, all regions have developed their Research and Innovation Strategies for Smart Specialisation (RIS3). This might help to prioritise research areas, based on the needs and resources of the regions, and improve coordination. Differences among regions in R&D efforts are important. Four regions accounted in 2012 for 69.7% of all R&D expenditures: Madrid (25.6%), Catalonia (22.3%), Andalusia (11.1%) and the Basque Country (10.7%). In relative terms, the leading regions are the Basque Country, Navarre, Madrid and Catalonia with a GERD by GDP of 2.2%; 1.9%, 1.8% and 1.5% respectively. The Basque Country is the only region that has increased its yearly R&D intensity over the last three years (2%, 2.1% and 2.2%) (ICONO-INE: 2014).

The critical impact of the financial crisis on the Spanish R&I system has revealed significant lessons on its challenges and opportunities. The Spanish policy mix has evolved considerably over the last decade towards a diversified set of instruments aimed at tackling the structural challenges of the system (EW, 2014b). All these instruments for the promotion of innovation and knowledge and technology transfer have been included and reinforced in the new strategy, the Spanish Strategy for Science, Technology and Innovation (EECTI) (2013-2020); the new plan, the Spanish State Plan for Scientific and Technical Research and Innovation (PECTI) (2013-2016); and other legislative measures, such as the Law of Science, Technology and Innovation (LCTI) and the Entrepreneurship and Internationalisation Support Act (Law 14/2013). However, the persistence of the challenges (EECTI 2013-2020; ERAC, 2014) might indicate that the policy mix could have been improved in its appropriateness, effectiveness and efficiency in addressing these. The still limited strategic policy planning and evaluation culture (EECTI 2013-2020; ERAC, 2014) hinders the assessment, as well as the evolution of the policy actions towards an increasing efficiency. It seems that the policy mix has evolved following a dynamic towards a higher diversification, without sufficiently considering whether this diversification was more effective in addressing the challenges than a reduced action, but of a higher scope, would have done. For example, in an environment of budgetary restriction, it could have been more appropriate to reduce the number of policy measures by focusing on the strengths of the system. The new strategy and plan – despite being published in 2013, when the effects of the financial crisis on R&I were evident – did not include any specific measure to address these. The strategy EECTI (2013-2020) identified the financial crisis as a threat (p. 15), but did not envisage any specific measure to address it. In addition, the delays suffered in launching the main programme for basic R&D (“Promotion of R&I towards societal challenges”) reveal that policy implementation has been unreliable and

the strengths of the system have not been considered. The budgetary crisis of the CSIC in 2013, despite their increasing research performance, should be also mentioned. The mobilisation of important research organisations in support of R&D indicates a lack of coordination with other stakeholders in the implementation of policy measures. Finally, partly due to the budget reduction, lack of implementation of ambitious reforms and the implementation of more temporary ones, the increasing levels of temporariness, unemployment and a probable brain drain problem all make the need for restoring the career path for young researchers and human resources management the most pressing problem of the Spanish R&I system (ERAC, 2014). Therefore it could be argued that the policy mix has lacked flexibility, as well as ambition and consensus-building among stakeholders, to at least alleviate the negative consequences of the financial crisis in the R&I system.

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1. Overview of the R&I system

1.1 Spain in the European RDI landscape

Spain is the second largest country in the European Union (EU-28) with an area of 498,511 sq.km (Eurostat-2014).¹ In 2014, its population was 46.5 million inhabitants, making it the 6th most populous country in the EU-28 (9.2% of the total population). That year, it produced around 7.8% of the EU-28 Gross Domestic Product (GDP), occupying the 5th position. Its total GDP in 2013 was €1,023bn. The Spanish GDP has been decreasing over the last years by 1.6% in 2012 and by 1.2% in 2013, while in the Eurozone these percentages were respectively -0.4 and 0.1%. As in all EU countries, its Human Development Index is high (0.869 in 2013 – United Nations Development Programme - 2014). However, it has a high level of inequality income distribution, with a Gini coefficient² of 33.7 in 2013, and occupying the 21st position within the EU-28. The GDP per capita in 2013 was €22,300, below the EU-28 average of €25,700 and 13th in the EU- 28. Spanish GDP per capita has decreased by 600 euros since 2008, while the EU-28 average has increased by 700 euros during the same period. The economic crisis has badly affected the unemployment rate, which is the second highest in Europe (24.4% in 2014). However, some minor indication of recovery in the unemployment rate has been seen over the last year, as it has decreased by 1.7 perceptual points (Eurostat-2014).³

The crisis has also severely hit the Spanish R&I system, turning the positive trend seen over the pre-crisis period into a negative one (EC, 2013e). Spain doubled its Gross Expenditure on Research and Development (GERD) in absolute terms over the period 2002-2008, showing an increasing trend well above the EU-average. In relative terms, GERD as a percentage of GDP increased from 0.96% to 1.32% over the same period. It reached a level of 1.35% in 2009 and 2010, but quickly declined in 2011 down to 1.32% and decreased further in 2012 and 2013 to 1.24%, reaching a figure similar to the one in 2007 (1.27%). GERD per capita was 286 in 2012, nearly half of the EU-28 average (530.1). However, turnover from innovation⁴ as a percentage of total turnover was 19% in 2010, well above the EU-27 average of the same year (13.4%). Declining trends in public budgets for R&D have been significant since the financial crisis. Government Budget Appropriations or Outlays on R&D (GBAORD) decreased by 14.7% in 2012 and by 14.1% in

¹ Unless it is indicated, all data come from Eurostat (extracted in December 2014).

² It measures the extent to which the distribution of income among individuals or households within an economy deviates from an equal distribution, in which 0 represents perfect equality and 100 implies perfect inequality.

³ Data come from Eurostat (2014 eighth month). Greece shows the highest levels of unemployment with 26.4% in 2014 seventh month. The change in unemployment over the last year compares the figures of 2014 and 2013, eighth month.

⁴ "This indicator is defined as the ratio of turnover from products new to the enterprise and new to the market as a % of total turnover. It is based on the Community innovation survey and covers at least all enterprises with 10 or more employees. An innovation is a new or significantly improved product (goods or services) introduced to the market or the introduction within an enterprise of a new or significantly improved process." (Eurostat)

2013. As Spain is a “moderate innovator”⁵ (EC, 2012a; EC, 2013a; and EC, 2014b), whose strengths lie in areas that rely more on public funds – mainly in its human resources base and research production (see section 2) – this quick decline in public budgets for R&D has raised important concerns among research-related institutions, such as the Spanish Confederation of Scientific Societies ([COSCE](#)), about the sustainability of the Spanish R&I system (see Annex i and Erawatch Country Report – EW, 2014a: 17 and 2014b: 18-19).

1.2. Main features of the R&I system

The distribution of GERD in 2012 by source of funds shows that the Business Enterprise and Government sector are the main funders, with 45.6% and 43.1% of total funding performed, followed by small percentages from other sectors: Abroad (6.6%), Higher Education (3.9%) and Private Non-Profit (0.6%) (Eurostat-2014).⁶ Compared with the EU-28 average, the Spanish GERD distribution show a higher reliance of its R&I system on public funds.⁷ The government sector has decreased its total funding over the last two years by 15.1%. As mentioned, disinvestment in the public budgets for R&D has been important in the same period with GBAORD figures decreasing by 14.7% in 2012 and by 14.1% in 2013, reaching a figure of €5,310m. This trend indicates that public R&I funding has not been used as a counter-cyclical engine to overcome the financial crisis.

Spain has a quasi-federal decentralised system of governance. Regions (“Autonomous Communities”) have political and administrative responsibilities for research and innovation, and are in charge of university funding. They play an important role in research and innovation, as regional budgets represent 60% of total GBAORD (ERAC, 2014). This decentralised R&I system poses some challenges to its governance (OECD, 2006; ERAC, 2014) as in the past, the competences between national and regional levels of governance were not clearly assigned.⁸ This led regions to develop similar R&I strategies and plans and to launch similar and often overlapping instruments, programmes and agencies at both regional and national administrative levels⁹ (EW 2010 and 2011). Regions tend to carry out some innovation policies more often, such as the ones targeting Small and Medium-sized Enterprises (SMEs). Some developments might improve the coordination of national and regional R&I policies: for example, the new Law of Science, Technology and Innovation (LCTI, 2011) aimed at improving national and regional coordination through the Council of Science, Technology and Innovation (CPCTI) (see Annex iii). In addition, Research and

⁵ Together with Croatia, Czech Republic, Greece, Hungary, Italy, Lithuania, Malta, Poland, Portugal and Slovakia (EC, 2014b)

⁶ At the time of writing this report, 2013 figures were not available by source of funds.

⁷ 45.6% against 54.9% for the private sector, 32.8% against 43.1% for government, 6.6% against 9.8% for abroad, and 3.9% against 0.9% (Eurostat- 2014).

⁸ The Spanish Constitution grants powers to both the national and regional administration for promoting scientific and technical research. National authorities are in charge of the coordination in this area (Art. 149.1.15 and 148.1.17). However, allocation of competences relating to innovation are not mentioned in the Constitution. See Gómez (2007) and Díez-Bueso (2013) for more details on the R&I national and regional allocation of competences.

⁹ Such as the case of scholarships for PhD students; R&I project support for firms, PRO or HEI; National and regional “accreditation” agencies – grant researchers with a declaration that allows them to access certain job positions (see section 3.2.2 for the different regional accreditation agencies). Moreover, several regional R&I policy plans are similar to the national “plan”.

Innovation Strategies for Smart Specialisation (RIS3) might help to reduce fragmentation on research and innovation policies. The “smart specialisation” concept has been widely adopted by national and regional Spanish authorities. It was included in the Spanish Strategy for Science, Technology and Innovation (EECTI) (2013-2020) in one of its priority axes and all Spanish regions are registered on the Smart Specialisation Platform (S³P)¹⁰ and have developed their strategies for smart specialisation (see section 2.6). This might help to prioritise research areas, based on the needs and resources of the regions and improve coordination. Differences in R&D efforts among regions are important. Four regions accounted in 2012 for 69.7% of all R&D expenditure: Madrid (25.6%), Catalonia (22.3%), Andalusia (11.1%) and the Basque Country (10.7%). In relative terms, the leading regions are the Basque Country, Navarre, Madrid and Catalonia with a GERD by GDP of 2.2%; 1.9%, 1.8% and 1.5% respectively. The Basque Country is the only region that has increased its yearly R&D Intensity over the last three years (2%, 2.1% and 2.2%) (ICONO-INE: 2014).

1.3. Structure of the national research and innovation system and its governance

The main responsibilities for research and innovation policy design and operational management are concentrated in the Ministry of Economics and Competitiveness (MINECO),¹¹ which in 2014 distributed 75% of the Spanish State Budget¹² on R&I (ICONO-Ministerio de Hacienda: 2014). The Ministry of Industry, Energy and Tourism (MINETUR) accounted for 20% of the budget. Other R&D players are the Ministry of Defence (2.7%) and the Ministry of Education, Culture and Sports (1.5%) (ICONO: 2014).

The MINECO, assisted by the State Secretary for Research, Development and Innovation (SEIDI), is responsible for drafting and managing the main R&I instruments: the multi-annual “strategies” and “plans”. The Spanish Strategy for Science, Technology and Innovation (EECTI) (2013-2020) is the strategy that sets the rationale, objectives and indicators of the Spanish R&I policy. The Spanish State Plan for Scientific and Technical Research and Innovation (PECTI) (2013-2016) is a multi-annual plan that implements the EECTI by setting its priorities, programmes, coordination mechanisms, costs and sources of funding. The new EECTI and PECTI were approved on 1st February 2013. The proposals have merged the two strategies and plans originally envisaged by the new Law of Science, Technology and Innovation (LCTI 2011).¹³

¹⁰ This platform “assists Member States and regions to develop, implement and review Research and Innovation Strategies for Smart Specialisation (RIS3)” (RIS3: [on-line](#)). Aragon, Castille and León and the Basque Country have also been peer reviewed.

¹¹ Before December 2011, the Ministry of Science and Innovation (MICINN)

¹² Differently from GBAORD data, this budget includes not only subsidies and direct or indirect R&D and innovation expenditures but also loans and credits.

¹³ The PECTI replaced the National Plan for R&D and Innovation (2008-2011), extended to the end of 2012.

The MINECO is supported by the Executive Committee for Science, Technology and Innovation policy (CDTI) and two main advisory bodies: the Council of Science, Technology and Innovation Policy (CPCTI) and the Advisory Committee of Science, Technology and Innovation (CACTI). The CDTI is an inter-ministerial body responsible for the planning, evaluation and coordination of the main Spanish instruments for R&D and innovation. It is in charge of the coordination with regional governments and other actors of the R&D system. The CACTI gathers representatives of the research community, enterprises and trade unions. The main funding bodies involved in the implementation of R&I policies are the Spanish Research Agency and the Centre for Industrial Technological Development (CDTI). The Spanish Agency (to be created)¹⁴ aims to be an autonomous entity that will assign R&D funds on grounds of scientific merit. The CDTI is a public corporate entity engaged mainly in the promotion of innovation and technological development for companies. Other institutions, such as the Carlos III Health Institute (ISCIII) also fund research. The Information System of Science, Technology and Innovation (SICTI) is responsible for the data collection and analysis for the monitoring of all policy programmes and instruments of the R&I policy¹⁵ (see Figure 1).

Regarding the size and performance of the research system, the GERD performed by different sectors, the number of people involved in R&D activities and academic performance were considered. The business enterprise sector is the main performer of R&D with 53.2% of GERD performed in 2013 (0.66% of GDP), followed by the Higher Education Sector (27.9% of GERD and 0.35% of GDP), Government sector (18.7% of GERD and 0.23% of GDP), and Private Non-Profit sector with 0.2% of GERD (INE - 2014).¹⁶ The number of people employed in R&D activities in 2013 was 203,612 (FTE). After increasing by more than 65% from 2002 to 2010, this population has been decreasing since 2010 (by 3.1% in 2011, by 2.9% in 2012, and by 2.5% in 2013), coming back to total figures similar to the ones of 2007 (Eurostat - 2014). Based on the FTE data for 2012, 42.8% of R&D employees are working in the private sector, 37% in Higher Education Institutions (HEIs), 20% in Public Research Organisations (PROs) and 0.2% in the Private Non-Profit sector.

Taking the research performance into account, universities showed the highest research performance level in the total number of international articles published in 2003-2011 (ICONO-Scimago: 2013). In 2011, universities published around 70.2% of total publications, followed by the health sector (26.1%), Public Research Bodies (OPIs) (22.9%), others (2.5%) and firms (1.6%). However, taking into account the quality of publications ("normalised impact"), OPIs showed the highest impact, with 1.6 publications, followed by the health sector (1.4), Universities (1.3) and firms (1.3).

Small and Medium-sized Enterprises (SMEs) comprise 91.2% of the total number of firms that perform R&D (11,1213 in 2012). SMEs make up 47% of private sector R&D

¹⁴ The State Secretary for Research Development and Innovation (SSRDI) channels the funds for research at national level.

¹⁵ The monitoring system for the EECTI includes: SICTI, the Automated Data Platform for I+D+I (PAID); the Network of Public Policies for R&I ([REDIDI](#)) and the technology that has implemented the Spanish Observatory for R&D (ICONO).

¹⁶ Data for 2013 is provisional. At the time of writing this report, Eurostat had not disclosed all the GERD information by sectors for Spain. INE data is presented. These percentages in 2012 were: 53.2% for the Business Enterprise sector, 27.7% for HEI and 19.1% for the Government sector.

(€7,094m). Large firms (which represent 8.8% of the total number of R&D performing firms) perform 53% of private sector R&D. The service sector and industry represent respectively 49% and 48.3% of business sector expenditure. “Professional R&D activities” represent 59% of the service sector expenditure, followed by TIC (24.4%). “Transport” and “Pharma” are important sectors, with 17.5% and 17% of the industry sector.

The Spanish R&I system has undergone important changes over the last five years. Considering the sustainability of the R&I system, the most important changes are probably the severe public budget cuts suffered over the last four years, especially the ones of 2012 and 2013 (see section 2.5), and the erratic implementation of the policy framework (see section 5). These budget cuts have threatened to set back the progress made over the pre-crisis period when important R&I efforts were made (see section 2.5). In addition, the Spanish governance system has changed considerably in this period due to the approval of the new law (LCTI) in 2011 as well as the approval of the new strategy (EECTI 2013-2020) and the new plan PECTI (2016-2020) in 2013. These documents have set the agenda for changing the Spanish R&I system (see section 2.2). However, the implementation has been difficult for several reasons: the already-mentioned public budget cuts for R&I; the fiscal consolidation measures adopted in 2012 that have delayed the implementation of the Spanish Research Agency and put on hold young researchers’ access to permanent positions; and the lack of flexibility to adapt the objectives and pathway to a new environment (see section 5). In addition, the publication of the Entrepreneurship and Internationalisation Support Act (Law 14/2013) in 2013 (see section 2.2), the elaboration of the RIS3 strategies over 2013 and 2014 and the grass-root movement in support of science (see section 2.6 and Annex ii) are some other important changes that have occurred over the last five years (see Summary Table below).

Table 1. Summary table

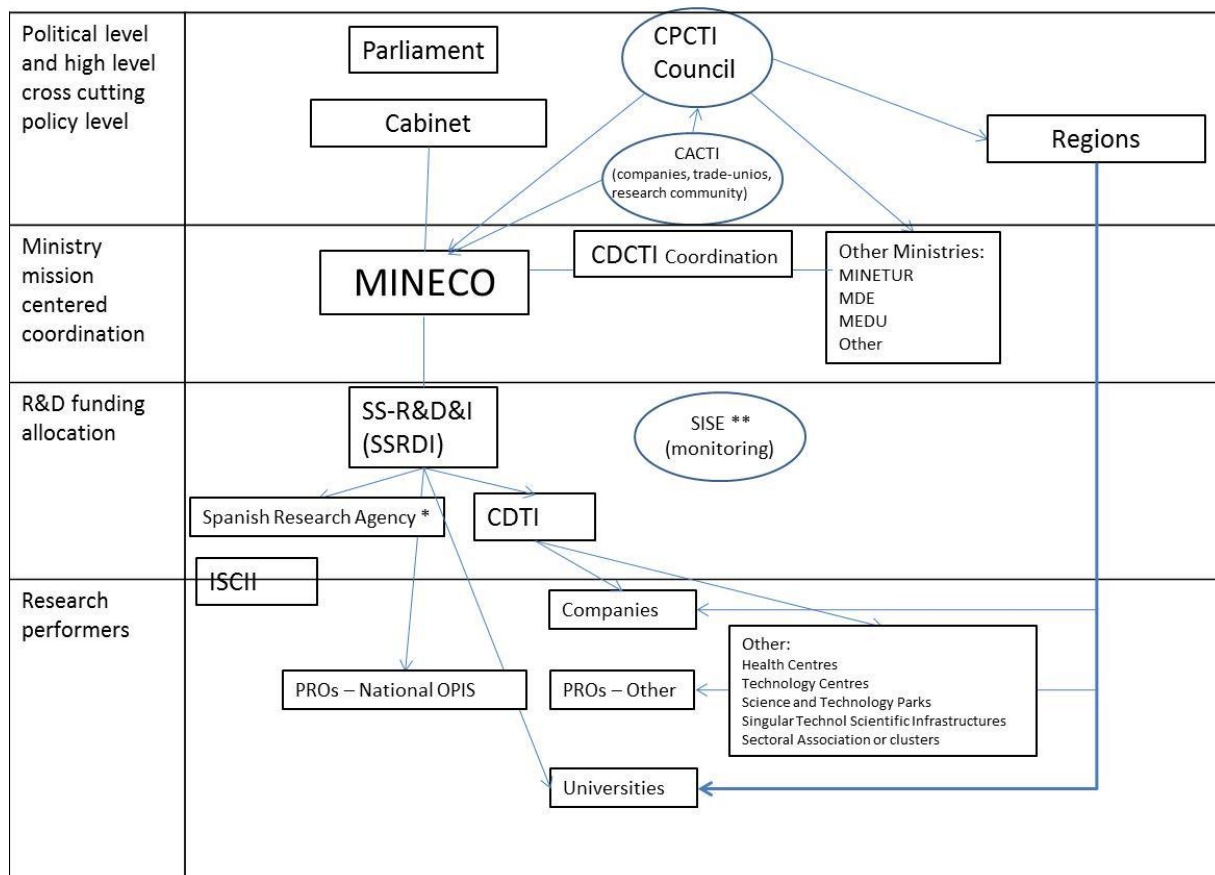
Main changes in 2014
... Autonomous Regions develop their Smart Specialisation Strategies (RIS3) as a Structural Funds pre-requisite
... European Research and Innovation Area Committee (ERAC) carries out a peer review evaluation of the Spanish R&D System. ERAC (2014)
... The Spanish Association Agreement 2014-2020 was approved
... Announcement of the loosening of the fiscal consolidation measures adopted in 2012 that affected R&D for 2015. The Research Agency will be created in 2015 and the replacement rate of retirees will be increased up to a 50% from the current 10%. ¹⁷
Main Changes in 2013
... Important budget cuts in public funds for R&D
... Important delays in launching important R&D calls and programmes
... The Spanish Strategy for Science, Technology and Innovation (EECTI) (2013-2020) is approved on 1st February 2013 and replaces the previous National Science and Technology Strategy (ENCYT) and Spanish Strategy for Innovation (e2i)
... The Spanish State Plan for Scientific and Technical Research and Innovation (PECTI) (2013-2016) is approved on 1st February 2013 and replaces the National Plan for R&I 2008-2011, extended to the end of 2012
... Entrepreneurship and Internationalisation Support Act (Law 14/2013) is published on the 27th September 2013
... The Spanish National Research Council (CSIC) undergoes a major budget crisis
... Grass-root initiatives in support for science continue over the year
Main changes in 2012
... Important budget cuts in public funding for R&D
... The R&D system of governance is being reorganised due to the change in government, the elaboration of the new strategy and plan and the implementation of some measures announced in the law LCTI.
... Previous plan (National Plan for R&I 2008-2011) and strategies are extended one year
... Fiscal consolidation measures affect R&D freezing the creation of the Spanish Research agency and fixing the replacement rate of retirees of permanent positions in a 10%
... The important public budget cuts raise concerns among research related organisations launching a grass-root movement in support for science
Main changes in 2011
... Law of Science, Technology and Innovation (LCTI 2011) (1st June 2011) replaced the so-called Law of Science of 1986
... New Spanish President in office since December 22nd and close down the Ministry of Science and Innovation (MICINN) created in the previous legislative term (2008-2011) was closed down. Their competences were transferred to the Ministry of Economy and Competitiveness (MINECO)
Main Changes in 2010
... Last year of publication of the SISE Report (Evaluation of the national calls)
... The University Strategy 2015 ¹⁸ is published
... The Spanish Strategy for Innovation (e2i) ¹⁹ is approved

¹⁷ On March 2015 the Council of Ministries has approved a 100% replacement rate for the OPIs. ([MINECO news 20.05.2015](#))

¹⁸ [University Strategy 2015](#).

¹⁹ [Spanish Strategy for Innovation](#).

Figure 1. Structure of the national research and innovation system



2. Recent Developments in Research and Innovation Policy and systems

2.1 National economic and political context

The crisis in Spain has particularly affected the unemployment rate, which is the second highest in Europe (24.4% in 2014). Over the last year there was a slight positive trend in unemployment figures, as it decreased by 1.7 perceptual points.²⁰ Spanish GDP decreased by 1.6% in 2012 and by 1.2% in 2013, while in the Eurozone overall these percentages were respectively -0.4 and 0.1% (see Table 1). The debt crisis forced Spain to apply severe cuts to its public budget, which have particularly affected the budgets for R&I. GBAORD decreased by 14.7% in 2012 and by 14.1% in 2013. The budget for public expenditure by the central government on R&I (PGE) decreased in 2012 by 25.6% and in 2013 by 7.2% (ICONO-MINECO: 2014). The foreseen PGE for 2014 and 2015 has increased by 3.6% and 4.2%, leading to a budget of €6,406m. Despite these increases, the PGE for 2015 is lower than the one of 2006 (€6,546m) (ICONO-MINECO: 2014). In addition, in the period 2009-2012, between 21% and 45% of the yearly public government budgets were not executed (Molero and de No, 2012a; FECYT, 2013a: 31)²¹ (see section 2.5). During the last few years, several national and regional calls have been delayed (e.g. Promotion of R&I towards societal challenges and Ramón y Cajal programme) or cancelled (e.g. JAE-doc). Partly due to large budget cuts from the government since 2010, the Spanish National Research Council (CSIC) underwent a major budget crisis during the summer of 2013.²² An extra PGE budget line was committed by the national government²³, but it was not consolidated in the 2014 PGE budget (Molero and de No, 2014a, 2014c). Concerns raised in 2012 – by research-related organisations and institutional and grassroots action in support of science – about the sustainability of the Spanish R&D system, remained during 2013 and 2014 (see Annex i and EW, 2014a and EW, 2014b).

²⁰ See Footnote 2.

²¹ Provisional data for 2013 (November) facilitated by the FECYT with data of [IGAE](#) shows percentages of execution of the PGE – 46 of the MINECO (main programmes) as being around 47% in 2012 and 30% in 2013.

²² The [Spanish National Research Council](#) (CSIC) underwent one of its largest budget crises in years during the summer of 2013. Since 2010, the CSIC has suffered large budget cuts from the government, with approximately 500 million Euros of total reduction. The council had 100 million Euros deficit for 2013. The government injected 25 million Euros during the summer and 70 million in October 2013. During this period, the CSIC absorbed the savings of its institutes to deal with the cash shortages, which caused major concerns among the directors of its institutes about the sustainability of the centres. The CSIC is Spain's largest scientific organisation with about 15,000 employees and one of the most important research performers in the country, with about 20 per cent of the national scientific production. It appears that the crisis is having a significant impact, in particular on its young personnel employed under temporary contracts (see country report for 2013 EW, 2014b).

²³ A total of €70m was allocated in October 2013 in addition to the €25m allocated in June ([MINECO Press release \[18.10.2013\]](#)). PGE 2014 allocated €75m more to the CSIC than in PGE 2013, a 0.1% increase. However, PGE 2013 does not include the extra budget line of €95m allocated in 2013 (Molero and de No, 2014c).

Regulatory changes to comply with public deficit targets affected the R&I system. For example, in order to be able to create the new Spanish Research Agency envisaged by the LCTI Law (2011) it was necessary to include an amendment to the draft of the General State Budget of 2012 as this forbade the creation of any public agency. This amendment allowed the creation of the agency under the condition of being created at zero cost ([BOE 30.06.2012: 46441, 46563](#)). The agency is still to be created. In the same way, some regulatory measures to correct the public deficit (e.g. Royal Decree-Law 20/2011) have limited staff recruitment and the filling of positions left vacant by retirees of permanent positions (public officials). These legal restrictions are meant to be changed in 2015. R&D will be considered a priority area, which will increase the percentage of filling of positions left vacant by retirees from the current 10% up to 50%. The Spanish Research Agency is also scheduled to be created in 2015.²⁴

The new strategy EECTI (2013-2020) and the new plan PECTI (2013-2016) were approved on 1st February 2013. These documents set out and implement the rationale and objectives of the Spanish R&I system. They have introduced important changes into the system (see section 2.2). After a request by the Spanish authorities in November 2013, the European Research and Innovation Area Committee (ERAC) carried out a peer review evaluation of the R&D Spanish (see section 2.7) in 2014. In addition, the basic principles of the Spanish Research System and R&D policy framework have undergone important changes in previous years, as a result of the approval of the Law of Science, Technology and Innovation (LCTI 2011) (1st June 2011)²⁵ (see Country Report for Spain 2012 (EW, 2014a) for more details). Furthermore, the Entrepreneurship and Internationalisation Support Act (Law 14/2013) was published on 27th September 2013 and includes measures to promote entrepreneurship and facilitate finance for the creation of new business.

2.2 National R&I strategies and policies

Spain has a quite well developed R&D structure and major efforts have been made to improve the R&I policy mix over the last decade (EW, 2014a: 28-30).²⁶ The most important ones have been: a clear shift towards innovation policies; the increasing importance of knowledge transfer from the research sector to the productive one; the increasing importance also of competitive funding and the implementation of a more diversified set of instruments (EW, 2014a: 28-30).²⁷ However, the effectiveness and stability of the R&I system have been challenged during the last years by a decreasing trend in public R&D

²⁴ Europa Press from a “government control session” in the Parliament [[24.09.2014](#)] and *El Pais* [[26.09.2014](#)]

²⁵ The arrival of a new government (21st December 2011) also introduced important changes in the system (e.g. the Ministry of Science and Innovation (MICINN) was closed down and the main R&D and innovation responsibilities were reallocated to the Ministry of Economy and Competitiveness (MINECO). Other Ministries with R&D responsibilities were reorganised or renamed (See Country Report for Spain 2012 (EW, 2014a) for more details).

²⁶ This trend can be seen through the objectives of the strategies and plans, new initiatives, instruments and budget allocation. See Country Report 2012 for more details (EW, 2014a)

²⁷ These changes refer to the R&D policy mix. The statement considers changes in the objectives of the strategies and plans, new initiatives, instruments and percentages of internal R&D budget allocation (EW, 2014a: 28-30). The decreasing trends in budget allocation to R&D is considered in the paragraphs that follow.

investments, an unstable implementation of the policy framework and a difficult structural coordination between national and regional authorities (OECD, 2006; ERAC, 2014). Central government provides an R&I policy framework, defining broad policy orientation on a multi-annual basis through national strategies and plans (e.g. the new strategy EECTI (2013-2020) and the new plan PECTI (2013-2016). This structure also includes mechanisms for coordination and involvement of stakeholders (e.g. regional and local authorities, industry, parliaments and citizens) through the CPCTI, in charge of the coordination with regional governments and other actors of the R&I system, and the advisory council CACTI, which gathers representatives of relevant research communities, enterprises and trade-unions.

However, this policy framework has suffered from inefficiencies for several reasons. The severe recent public budget cuts to R&I have threatened the sustainability of the R&I system (e.g. central government's budget for R&I (PGE) has returned the budget to 2005 levels) (see section 2.5.1). Driven partly by the budget cuts in R&I, the implementation of the new policy framework has suffered from delays. These have affected important instruments, R&D programmes, and research institutions. For example, the Spanish Research Agency is still to be created. Essential policy R&I programmes have been delayed (e.g. call for proposals of the R&I plan on fundamental research projects such as "Promotion of R&I towards societal challenges), reduced (e.g. Research Training – FPI and University Personnel Training (FPU) or cancelled (e.g. the [JAE programme](#), aiming to reinforce human resources for R&I). Among the cuts suffered by research institutions, it is necessary to highlight the budget crisis suffered by the [Spanish National Research Council](#) (CSIC).²⁸ In addition, despite the existence of mechanisms for coordination and the involvement of other agents, these mechanisms can be improved, as the Spanish R&D system is still challenged by a fragmented governance system at horizontal (regional) and vertical levels – higher and lower levels of governance (ERAC, 2014) (see section 2.7). For example, the ERAC (2014: 27-28) suggests addressing long and short term institutional changes through: (1) improving funding and evaluation mechanisms as well as governance of the system; (2) better human resource management within public research organisations and universities; (3) creating focus and critical mass in public research; (4) reinforcing internationalisation; (5) during the transition: allowing for an evolutionary approach under private law which maximises learning to reinforce policy instruments that work and to stop or amend those which do not; (6) operationalise a Research Agency.

The main policy documents launched recently are: the new strategy EECTI (2013-2020) and new plan PECTI (2013-2016) approved on 1st February 2013. In addition, the LCTI Law adopted in 2011 and the Entrepreneurship and Internationalisation Support Act published in 2013 have also included important changes in the R&D system.

EECTI (2013-2020) sets the rationale, objectives and indicators of the Spanish R&I policy. PECTI (2013-2016) is a multiannual plan that implements the strategy by setting its priorities, programmes, coordination mechanisms, costs and sources of funding. The proposals have merged the two strategies and plans originally envisaged by the new LCTI Law (2011). The changes in the strategies and plans indicates an increasing emphasis on innovation, public-private R&I collaboration, research excellence and other emerging topics, such as the promotion of R&I on societal challenges or the role of public procurement to

²⁸ See footnote 23.

promote R&I (see section 4.7). They have also introduced the concept of “Smart Specialisation”. One of the most significant changes of the EECTI (2013-2020) is that it has set a new lower target of 2% GERD per GDP for 2020, instead of the previous 3% target (see section 2.4 for more details).

The Spanish Strategy for Science and Technology and Innovation (EECTI) (2013-2020) establishes the rationale, objectives and indicators of the Spanish R&I policy. The EECTI merges the two strategies envisaged by the LCTI – the Spanish Strategy for Science and Technology (EEST) and Spanish Strategy for Innovation (EEI) – and replaces the previous National Science and Technology Strategy (ENCYT) and Spanish Strategy for Innovation (e2i).

The new strategy, EECTI, is based on the following: 5 basic principles, 4 general objectives disaggregated into 18 specific objectives, 6 priority axes and 6 articulation mechanisms. It also sets out indicators to measure the impact of the R&I policy.

Its 5 principles are: (1) coordination of R&I policies; (2) stable framework; (3) quality and social impact; (4) efficiency and accountability; (5) gender issues. Box 1 below shows the general and specific objectives set by the strategy.

Table 2. General and specific objectives of the Spanish R&I policies New EECTI 2013-2020

I.	Recognition and promotion of talent and employability (3)
	(1) Education and training in R&I; (2) Mobility and development of research career; (3) Human resources employability.
II.	Promotion of excellence (4)
	(1) Institutional empowerment; (2) Sustainability and use of scientific and technological infrastructures; (3) Promotion of frontier knowledge; (4) Promotion and development of emergent technologies.
III.	Business leadership (3)
	(1) Encouragement of business R&I; (2) Market oriented R&I activities; (3) Promotion of enabling technologies.
IV.	Promotion of R&I towards societal challenges (8)
	(1) Health, demographic change and welfare; (2) Bio economy; security and food quality, sustainable agriculture production and natural resources sustainability; (3) Energy, security and green energy efficiency; (4) Smart, sustainable and integrated transport; (5) Climate change, efficiency in the use of resources and raw materials; (6) Innovation and social change; (7) Digital economy and society; (8) Security, liberty and rights protection.

The EECTI is in line with the Europe 2020 strategy, by aligning its objectives to those set by the European strategy. It is also based on an analysis that identifies 14 challenges (see Table III) that are quite similar to the ones identified by the OECD Report (2006).

The Spanish State Plan for Scientific and Technical Research and Innovation (PECTI) (2013-2016) implements EECTI by establishing its priorities, programmes, coordination mechanisms, costs and sources of funding. PECTI merges the two plans envisaged by the LCTI – the Spanish National Plan for Scientific and Technical Research (PECT) and the Spanish National Plan for Innovation (PEI) – and replaces the National Plan for R&I 2008-2011, extended to the end of 2012, as well as Ingenio 2010, the previous national strategy for innovation.

The new PECTI places special emphasis on its integration into the European Research Area and to the promotion of: “(a) excellent basic research; (b) technological, industrial and firm leadership; and (c) scientific and technical research and innovation capabilities for grand challenges” (PECTI: 5).

Following the EESTI format, it is structured into 4 programmes and 18 sub-programmes (see Box ii in the Annex).²⁹ In addition, it includes 2 strategic actions – firstly Health and secondly Digital economy and society. It establishes 6 modes of participation³⁰ and 4 funding instruments – subsidies, loans, venture capital and tax incentives. As in previous plans, it is operationalised through annual programmes. It envisages indicators to evaluate the management and the result of the programmes.

PECTI is based on an analysis of the previous plan, which identified 8 main problems.³¹

Two public consultation processes on the strategy and plan were carried out in October 2012 and December 2012 (see EW, 2014a).

As mentioned, other relevant R&D policy initiatives that define the Spanish policy agenda are the LCTI Law (1st June 2011) and the Entrepreneurship and Internationalisation Support Act (Law 14/2013).

The Law of Science, Technology and Innovation (LCTI) (1st June 2011) replaced the so-called Law of Science 1986. The LCTI aims to improve coordination with regional and European authorities, to take into account the growth of the Spanish R&I system, to improve research careers and to help the transition to an economy based on knowledge and innovation. It also mentions gender issues and ethics. The emphasis on innovation, which was missing in the Law of 1986, the design of several mechanisms aimed at improving national and regional coordination (e.g. the Council CPCTI and the new information system (SICTI)), and the project of the Spanish Research Agency are the main relevant aspects of the new Law. It modifies the governance and human resources for R&D (e.g. new labour contracts and a unified professional career to facilitate mobility between public research centres and universities) and improves the mechanisms for the transfer of knowledge (e.g. by improving the granting of property rights to researchers and reducing the incompatibility for researchers employed by public institutions who wish to work in private firms) (See Annex iii for more details on the changes brought by the LCTI).

The Entrepreneurship and Internationalisation Support Act (Law 14/2013) was published on 27th September 2013, and includes the following measures:

- To boost entrepreneurship. Its aims include: training; the implementation of a legal status of “Limited Liability Entrepreneur” (*Emprendedor de Responsabilidad Limitada*) and “Progressively Formed Limited Liability Company” (*Sociedad Limitada de Formación Sucesiva*); reducing to 24 hours the time for creating a limited liability

²⁹ The programmes and sub-programmes are similar to the general and specific objectives of EESTI.

³⁰ (1) R&D and innovation programmes; (2) human resources actions; (3) research infrastructures and equipment; (4) complementary actions; (5) dynamic actions; and (6) collaborative actions.

³¹ (1) Administrative burden; (2) lack of coordination (inter-institutional; inter-departmental and inter-regional); (3) excessive number of instruments; (4) fragmentation of funding; (5) unrealistic time framework; (6) lack of adequate indicators in order to evaluate the development and impact; (7) lack of dissemination of the results of funded projects; and (8) ministerial organisational changes that created problems in the development of programmes.

company; the creation of Entrepreneur Service Points; and provision of a second chance for entrepreneurs through an extra-judicial payment mechanism.

- Fiscal measures: changing the timing of VAT obligation to actual cash payments; introducing tax allowances for reinvestment of profits; R&D allowances; and tax incentives for investments in entrepreneurs.
- To boost finance for entrepreneurs: eliminating charges so as to create incentives for issuing securities on Alternative Fixed-Income Market; making the regulations for refinancing agreements more flexible; and boosting new instruments to finance projects for internationalisation.
- To promote business growth: extending the list of activities not subject to municipal licences and reducing obstacles to entrepreneurs who wish to access public contracts.
- To boost the internationalisation of the Spanish economy: planning a new system of visas and residence permits to attract talent and investment from abroad; and envisaging a Spanish strategy for internationalisation.

Strategies and policies are increasingly attempting to encompass research, innovation and education aspects. The LCTI Law 2011 emphasises the role of innovation and the need to exploit potential synergies between research and innovation. The law envisaged separate strategies and plans for research and innovation, but these were finally merged into a single strategy and plan in order to improve the synergies between research and innovation. In addition, the new strategy clearly indicates that all these aspects should be addressed simultaneously: “This strategy approaches innovation on all its levels, including all the agents that share the responsibility for innovation, for promoting education, for encouraging technological change, scientific research, industrial development, infrastructures, etc.” (EESTI: 9). The new strategy also aims to promote “Industrial PhD programmes” involving universities and firms, with the view of attaining a better match between education and training supply and employment needs and of encouraging intersectoral job mobility. However, despite the progress and the spirit of the strategy, the structure of the Spanish R&D system presents some difficulties in relation to increasing the synergies between these three areas. The different allocation of competences at national and regional level (horizontal level of governance) would probably need clearer pathways in order to implement the agenda set by the law and the strategy (ERAC, 2014). The Ministry of Education, Culture and Sports (MEDU) is in charge of designing education policies at the national level, but it is the regions that are responsible for universities. The MINECO is the main body responsible for designing research and innovation policies at national level, but these are implemented through different bodies: the Spanish Research Agency for research (to be created) and the CDTI for innovation-oriented policies. In addition, the regions tend to implement innovation-oriented policies. In order to improve synergies, therefore, ERAC has suggested giving additional coordination capabilities to the Spanish Research Agency (ERAC, 2014). Investment in research infrastructures is also considered in policies and strategies.

The following tables show the main instruments (programmes and sub programmes) of the current national policy framework set out by the current PECTI plan (2013-2016) distributed by the Nation State Administration (AGE) (Table I - working plans 2013 and 2014) and the instruments (working lines and strategic actions) of the previous plan, the Spanish National Plan for R&I (2008-2011) (NP) (Table II – final distribution) with the

distribution of total funds and percentages for the last four years (see Table i in Annex ii for the equivalences between the two plans). Data for 2013 and 2014 should be treated with caution as it has been taken from the provisional budgets of the working plan of the new PECTI plan (2013-2016) and percentages are from my own calculations. This makes these figures non-comparable with figures of previous years as they represent final distribution for 2011 and 2012 (FECYT, 2012, 2014).

Table I indicates that total funds have decreased by 20.3% between 2014 and 2013. With the exception of the “Recognition and promotion of talent and employability” programme, which has increased by 26.2%, the rest of the programmes have decreased significantly: the “Promotion of excellence” by 60.5%, the “Business and leadership” by 28.4% and the “Promotion of R&I towards societal challenges” by 15.6%. Similarly, most of the instruments have decreased between 2013 and 2014, excluding the “Sub-programme for private R&I” that has increased by 323.9%, the “Sub-programme for employability” (39.8%), the “Sub-programme for education and training” (14.3%), the “Sub-programme for knowledge generation” (10.1%), and the “Strategic Action in health” (9.8%).

Percentage changes from 2012 to 2011 (Table II) show that the total funds from the central government for R&D distributed by the AGE have decreased dramatically (-44.4%). Major reductions have affected all the instruments, the Strategic Action for Health being the only instrument that has increased by 29.8% in this period. Scientific and Technological Infrastructures has decreased by 94%, Use of knowledge and technology transfer by 79% and Energy and Climate Change by 67.5%.

Table 3. Distribution of total budget and percentages across instruments of the New State Plan for Scientific and Technical Research and Innovation (PECTI) (2013-2016) in 2013 and 2014 by the AGE

Instruments	2013 Total (mill. €)		2014 Total (mill. €)		Av. Change 2013-14
Recognition and promotion of talent and employability programme	350.7	9.1%	442.5	14.4%	26.2%
Sub-programme for education and training	150.4	3.9%	172.0	5.6%	14.3%
Sub-programme for employability	182.5	4.7%	255.2	8.3%	39.8%
Sub-programme for mobility	17.8	0.5%	15.3	0.5%	-13.9%
Promotion of excellence programme	498.3	12.9%	197.0	6.4%	-60.5%
Sub-programme for knowledge generation	121.5	3.1%	133.8	4.3%	10.1%
Sub-programme for institutional empowerment	206.8	5.4%	63.3	2.1%	-69.4%
Sub-programme for scientific and technological infrastructures	170.0	4.4%	0.0	0.0%	-100.0%
Business leadership programme	831.9	21.5%	596.0	19.4%	-28.4%
Sub-programme for private R&I	81.4	2.1%	345.1	11.2%	323.9%
Sub-programme for enabling technologies	417.0	10.8%	126.0	4.1%	-69.8%

Instruments	2013 Total (mill. €)		2014 Total (mill. €)		Av. Change 2013-14
Sub-programme for collaborative R&I	333.5	8.6%	125.0	4.1%	-62.5%
Promotion of R&I towards societal challenges	2,183.3	56.5%	1,842.5	59.9%	-15.6%
Challenges and actions	1,540.3	39.9%	1,194.6	38.8%	-22.4%
Strategic Action in Health	87.4	2.3%	96.0	3.1%	9.8%
Strategic Action - Digital Economy and Society	555.6	14.4%	552.0	17.9%	-0.7%
TOTAL	3,864.2	100.0%	3,078.1	100.0%	-20.3%

Source: own calculations from MINECO working plan 2013 and 2014

Table 4. Distribution of funds and percentage across instruments of the Spanish National Plan for R&I (2008-2011) (NP) in 2011 and 2012 by the AGE

Instruments	2011		2012		2011-2012 % change
	Total funds (mill. €)	%	Total funds (mill. €)	%	
Instrumental Working Lines (IWL)	2,657.3	79.9%	1,482.3	80.3%	-44.2%
1. R&I Projects	1,392.70	41.9%	773.5	41.9%	-44.5%
2. Articulation and internalisation of the system	715.9	21.5%	506.4	27.4%	-29.3%
3. Human resources	271.4	8.2%	161.8	8.8%	-40.4%
4. Scientific and technological infrastructure	206.7	6.2%	12.5	0.7%	-94.0%
5. Use of knowledge and technology transfer	38.6	1.2%	8.1	0.4%	-79.0%
6. Institutional reinforcement	32	1%	20.0	1.1%	-37.5%
Programme of Science and Innovation Culture	4	0.1%	3.3	0.2%	-18.8%
Strategic Actions (SA)	662.4	19.9%	360.8	19.5%	-45.5%
Telecommunications and Information Society	495.6	14.9%	218.5	11.8%	-55.9%
Health	90.6	2.7%	117.6	6.4%	29.8%
Energy and Climate Change	76.2	2.3%	24.8	1.3%	-67.5%
TOTAL	3,323.70	100%	1,846.4	100.0%	-44.4%

Source: own calculations from data FECYT (2012) and FECYT (2014)

The distribution of the Spanish GBAORD by thematic social economic objectives³² shows that in 2013 over 52% of the funds could be considered as generic while 48 % could be directly assigned to specific technological or scientific areas. Generic funds increased in weight from 35.8 in 2008 to 52 in 2013. Regarding thematic R&D priorities in 2013, the most important ones are Health, with 32% of the funds being assigned to specific technological or scientific areas, and Industrial production and technology (IPT - 17.6%), followed by Agriculture (13.6%). Comparing the distribution of the last two years, it can be observed that Spain has increased its participation in Health and Agriculture. The percentage of the defence-related GBAORD is lower than the EU average, representing in 2013 0.8% of GBAORD compared to the 4.6% of the EU-28 average.³³ According to the provisional budget for R&I distributed by the State Secretary of Research Development and Innovation for 2014, the State programme “Promotion of R&I towards societal challenges” will distribute €1,842.5m (-15% lower than the one of 2013) (MINECO, 2014).

2.3 National Reform Programme 2013 and 2014

The [National Reform Programme \(NRP\) 2013](#) and [NRP 2014](#) follow the agenda of reforms stated in the [previous NRP](#), which aimed to tackle the restriction of growth and employment creation. The reforms of the NRP 2014 are structured in five priority areas: (1) fiscal consolidation and growth; (2) re-establishment of credit flows; (3) boost in growth and competitiveness; (4) addressing of unemployment and social consequences of the financial crisis; and (5) modernisation of Public Administration. These measures are also aimed at achieving the objectives set by the Europe 2020 Strategy.³⁴ Both documents recognise the importance of R&D in boosting productivity, competitiveness and economic growth (NRP 2013: 30; NRP 2014: 50). Both of them state that the spending priorities have been revised, minimising the budget cuts for R&I. However, the overall level of ambition in terms of R&D spending efforts has diminished, as a lower R&D intensity target of 2% has been set (instead of the previous 3% one). The reason pointed out in the EESTI strategy is to establish a more realistic target. Similar to the previous NRP, the NRP 2013 and 2014 mention the approval of the new EESTI Strategy (2013-2020) and new PECTI plan (2013-2016) as important measures to improve the research system and to create growth. NRP 2013 includes as a new feature the Entrepreneurial Support Act and its

³² GBAORD is probably the most comprehensive approach for analysing the thematic priority setting of the Spanish policies for R&D and innovation. See EW (2011) for different alternatives for analysing the thematic focus and the advantages and disadvantages.

³³ Central government's budget for R&I (PGE) allocated to defence represented 6.1% of the total budget (€5,932.2m) (Molero and de No, 2014a). In 2014, this percentage increased up to 8.3% (€506.9m of €6,146.1m), increasing by 39.9% (Molero and de No, 2014a). In 2015, this percentage increased again, reaching 11.4% (€726.9m of €6,406.8m), increasing by 43.4% with respect to the previous year.

³⁴ These highlighted reforms of NRP 2013 were: (1) Fiscal consolidation of the public accounts: fiscal consolidation and Social Security measures; (2) Monitoring of the labour market reform; (3) Law on the De-indexing of the Spanish Economy; (4) Law on Market Unity Guarantee and the Regulatory Streamlining Plan; (5) Entrepreneurial Support Act and its Internationalisation; (6) Modernisation and streamlining of public administration services: Law on Rationalisation and Sustainability of Local Authorities; (7) Law on Professional Associations and Services; (8) Reform of corporate governance.

internationalisation, which includes fiscal incentives for business innovation and employment and some R&D tax incentives. The first new feature of NRP 2014 is to show the intention of reaching the 2% R&D investment objective for 2020 through an increased participation by the private sector, which is intended to grow from 0.60% to 1.20% in 2020. The second new aspect is to address the changes suggested by the peer review exercise of the Spanish R&D system, which was carried out by the European Research Area Committee (ERAC) in 2013-2014 (ERAC, 2014) (see section 2.7).

The NRP 2013 highlights the approval of the new EESTI Strategy (2013-2020) and new PECTI plan (2013-2016) to achieve a more efficient allocation of stable resources to R&D activities; to increase business investments in R&I (the future law supporting entrepreneurs) and to improve coordination between the central and regional governments (e.g. the information system SICTI, harmonising criteria and evaluation practices and the implementation of instruments for joint programming and co-finance). These documents and measures are referred in Axis 4, “Boost to innovation and new technologies”, included in the third priority area (AGS 3)³⁵ “Promoting growth and competitiveness for today and tomorrow”. It highlights the alignment of the strategy and plan with the Europe 2020 Strategy and its contribution to the Research and Innovation for Intelligent Specialisation Strategies (RIS3). It mentions that Spanish regions are developing their RIS3 strategies, which were to be finished by the end of 2013. It also emphasises the aim of increasing Spanish participation in the EU Framework Programme from the current 8.3% to 9% and the returns from public research bodies should increase by 20%, while the percentage of projects headed by Spanish entities should reach 10%. In addition, the creation of the Spanish Research Agency is mentioned.

The Support Act to promote entrepreneurship and its internationalisation includes the changes in the allowance of tax reduction for R&D, “allowing for tax credits for R&I that were not applied in one year to be recovered, provided that employment is created or maintained” (p.30). “Under certain conditions, the fiscal credits for research and development may be paid in, with a maximum total limit of 3 million euros per year, without the need to generate a positive result which allows for its compensation” (p. 60). Axis 2 includes: “Guarantee a favourable environment for entrepreneurs, providing aid for the start and development of business projects and supporting their internationalisation”, also included in priority AGS 3. The aim to “Boost research, technological development and innovation” is also a strategic line of action for Spain and a thematic objective of the European Regional Development Funds (ERDF). It focuses on four main lines: infrastructure investment; support for investment in public projects; support for investment in private projects; and a financial instrument dedicated to innovation. Spain aims at making greater use of innovative financial instruments, favouring the financing of R&I in Small and Medium-sized Enterprises (SMEs).

The NRP 2014 also highlights the approval of the new EESTI Strategy (2013-2020) and the new PECTI plan (2013-2016). These documents and measures are referred to in Axis 4 “Innovation and new technologies”, and included in the third priority area (AGS 3) “Promoting growth and competitiveness for today and tomorrow”. NRP 2014 mentions the

³⁵ These correspond to the priority areas identified in the Annual Growth Survey 2013 (AGS), which are: fiscal consolidation; restoring lending to the economy; structural reforms; tackling unemployment and the social consequences of the crisis; and modernising public administration.

intention of increasing private investment in R&D through the improvement of the conditions of private loans and fiscal incentives (2.4); the creation of the Spanish Research Agency; to boost European partnerships through joint programming and to improve the human resources for R&D. R&D-related topics are also mentioned in Axis 3, through the consideration of the measures proposed by the expert group on the Spanish university sector, “Proposal for the reform and improvement of the efficiency and quality of the Spanish University System” (MEDU, 2013a) (see section 2.7). This might affect the situation of researchers working at universities and the internationalisation of universities. New technologies are mentioned through the Digital Agenda for Spain (ADE), which sets the strategy for the area for the period 2013-2015. New plans are envisaged to improve the e-administration procedures. This also includes the Plan for Digital Public Services. In addition, Structural Funds will devote a significant Budget to research and new technologies in the new financial framework 2014-2020, devoting 4,330 mill. of the European Regional Development Funds (ERDF) included in the thematic objective 1, “Boost research, technological development and innovation”.

In summary, with regard to R&I the NRP 2013 and NRP 2014 emphasise the new strategy and the new plan as important measures. These were also mentioned in the previous NRP. Some measures, such as the creation of the National Research Agency are mentioned again but not implemented. The Support Act to encourage entrepreneurship and its internationalisation is, as mentioned earlier, a new feature in the NRP 2013.³⁶ However, to set a new lower target for R&D (2% of the GDP for 2020) raises concerns about the real commitment in making R&I an important factor of economic competitiveness. In addition, given the trends in public and private R&D spending observed over the last 4 years, it might be difficult for Spain to reach the 2% target in time. Although the NRP 2014 indicates that this target is aimed to be reached through an increase in private investment (from 0.60% of GDP to 1.20% in 2020) measures included in these area are not new, nor clearly specified to boost such an increment. These facts raise concerns about the real scope of the measures on R&I.

2.4 Policy developments related to Council Country Specific Recommendations

After assessing the NRP 2014 and the [Stability Programme 2014](#) submitted by Spain on 30 April 2014, the Council of the European Union adopted the Country Specific Recommendation (CSR) [[COM\(2014\) 410 final](#)] with some relevant recommendations for R&D policy. The document recognises that the Spanish R&D system “needs to increase the quality of its scientific outputs, foster public-private co-operation and facilitate the conversion of research and innovation into commercial products” (p. 6). It indicates that the adoption of the new EESTI strategy (2013-2020) needs to be properly supported with public funding. It also points out that the creation of the Spanish Research Agency is still pending. This agency is meant to be tasked with the efficient management of public R&D investment. Recommendation number 6 includes the more R&D-related points,

³⁶ In addition, the NRP 2014 indicates that R&D will be considered as a priority area, which makes it possible to increase the replacement rate of retirees currently set at 10%. The NRP 2014 does not indicate a new replacement rate. This was later set by the government at 50% for 2015 (see footnote 6).

recommending the Spanish government to identify the sources of financing for the EESTI (2013-2020) and to put in place the new Spanish Research Agency. Other recommendations that might affect the R&D system include the implementation and evaluation of the 2013-2016 Youth Entrepreneurship and Employment Strategy (Recommendation 4) as this is intended to increase the labour market relevance of education. This final recommendation was in line with CSR 2013 [[COM\(2013\) 359 final](#)].

Regarding the policy measures taken to address these recommendations, the State Research Agency has not been created yet, although there is some news that indicates it will be created in 2015 (see section 2.1). Public funds for R&D slightly increased in 2014, but these were committed before the adoption of the recommendations.

2.5 Funding trends

2.5.1 Funding flows

As mentioned, the national R&D investment target for 2020 has been downgraded to 2% GERD per GDP for 2020 from the previous 3% target. This new target has been set by the new EESTI strategy (2013-2020) and ratified by the National Reform Programme 2013 and 2014 (NRP 2013; NRP 2014). It should be noted that this R&D intensity target for 2020 is lower than the current European average (EU-28, 2.07) and falls short of the 3% target fixed for the EU as a whole in the Europe 2020 strategy. Spain translated this EU-level target into a 3% national target in the [NRP 2011](#) and ratified it in the [NRP 2012](#). The previous national strategy for innovation (Ingenio 2010) established as goals in line with the Lisbon Strategy a 2% R&D investment by GDP for 2010; to increase the R&D contribution of the private sector up to 55%; and to reach the EU-15 average in the percentage of GDP allocated to ICT.³⁷ The new strategy and plan (EESTI and PECTI) recognised the importance of increasing the role of private investments in R&D. They include a target of 0.73% Business R&D Expenditures BERD/GDP for 2016 and the strategy a 1.2% for 2020. This level of private investment was ratified by the NRP 2014.

There has been no progress towards reaching these targets, due to the decreasing investments in R&D. After a period of increased economic growth, which ended in 2008, Spanish GDP has been showing negative or close to zero growth rate values. GDP decreased significantly (by 3.8%) in 2009 and stabilised during 2010 and 2011 with values around 0% (see Table 1). In 2012 and 2013, GDP again decreased significantly (by 1.6% in 2012 and by 1.2% in 2013) while in the Eurozone these percentages were -0.4% and 0.1% respectively. With regard to the input side of the innovation and science system, Spain made great efforts in the period 2002-2008 when its GERD in absolute terms doubled and increased well above the EU-average. In relative terms, the GERD by GDP increased from 0.96% in 2002 to 1.32% in 2008, reaching 1.35% in 2009. However, the financial crisis halted this positive trend. In 2010 the R&D intensity (GERD as a percentage of GDP) stagnated (1.35%), and decreased to 1.32% in 2011 and then to 1.27% in 2012. In 2013, R&D intensity decreased still further, to 1.24%, reaching a figure lower than the one in 2007 (1.23%). GERD euro per capita was 279.3 in 2013: nearly half of the European average (539.2).

³⁷ See AEVAL (2008) for an evaluation of Ingenio 2010.

The GBAORD in Spain and its regions has been decreasing significantly over the last four years, by percentages that went from -4.5% in 2010 up to a 12-14% the subsequent years. In 2013, GBAOD decreased by 14.5%, reaching a budget of €5,310m. R&D funded by Business Enterprise Sector as a percentage of GDP stagnated in 0.58%, far from the EU average of 1.1%. The percentages of R&D funded by the business sector, private non-profit and from abroad (as a percentage of the GDP) remained quite stable from 2009 to 2012 (0.58%, 0.01% and 0.08% respectively in 2012), but below the European averages of the same period (1.1%, 0.03% and 0.2). Regarding the distribution of GERD by sectors of performance, the business enterprise sector increased its share from 51.9% in 2009 to 53.2% in 2013. This increase went mainly against the decline in the Government Sector.

Table 5. Basic indicators for R&D investments

	2009	2010	2011	2012	2013	EU28 (2013)**
GDP growth rate	-3.8	-0.2	0.1	-1.6	-1.2	0.1
GERD (% of GDP)	1.35	1.35	1.32	1.27	1.24	2.02
GERD (euro per capita)	315.40	313.80	303.90	286.00	279.3	539.2
GBAORD - Total R&D appropriations (€ million)	8699.846	8308.156	7252.316	6185.179	5310.01	90505.611
R&D funded by Business Enterprise Sector (% of GDP)	0.59	0.58	0.58	0.58	N/A	1.1% (2012)
R&D funded by Private non-profit (% of GDP)	0.01	0.01	0.01	0.01	N/A	0.03% ^e (2012)
R&D funded from abroad (% of GDP)	0.07	0.08	0.09	0.08	N/A	0.2% (2012)
R&D funded by Framework Programmes (€ million)						
R&D funded by the Structural funds (€ million)						
R&D related FDI (€ million)			1330.7			
R&D performed by HEIs (% of GERD)	27.8%	28.3%	28.2%	27.7%	27.9%	23.20%
R&D performed by Government Sector (% of GERD)	20.1%	20.1%	19.5%	19.1%	18.7%	12.20%
R&D performed by Business Enterprise Sector (% of GERD)	51.9%	51.5%	52.1%	53.0%	53.2%	63.80%
Share of competitive vs. institutional public funding for R&D	N/A	N/A	N/A	N/A	N/A	N/A
Employment in high- and medium-high-technology manufacturing sectors as share of total employment	3.7	3.9	3.8	3.9	3.7	5.60%
Employment in knowledge-intensive service sectors as share of total employment	33.1	34.5	35.6	35.8	35.9	39.20%
Turnover from Innovation as % of total turnover	N/A	19	N/A	N/A	N/A	13.4% (EU-27, 2010)

Source: Eurostat.

Figures on the share of project vs. institutional public funding for R&D are not usually publicly available. However, data provided to the ERAC panel shows that competitive funding allocated from the national state has decreased significantly in recent years, due to the more fixed character of the other budget lines. Project funding (grants and fellowships) of the state R&D budget has decreased by 62% from 2008 to 2013 (ERAC, 2014: 20). The approximate share of project funding (over the total) was 52.1% in 2011 and 36.9% in 2013.³⁸

Venture Capital as a percentage of GDP has declined from 0.013% in 2009 to 0.008% in 2013. Employment in high and medium-high technology manufacturing sectors as a share of total employment slightly increased from 3.7% in 2009 to 3.9% in 2012, but decreased again in 2013 to 3.7%, a figure quite far below the EU-28 average (5.6% in 2011). An increasing trend could be observed in the percentages of employment in knowledge-intensive service sectors as a share of total employment that went from 33.1% to 35.9% from 2009 to 2013. Turnover from innovation as a percentage of total turnover was 19% in 2010, well above the EU-27 average for the same year (13.4%).

After 2013, only data on the central government's budget for public expenditures (PGE) to R&I is available.³⁹ This state level budget increased from €4,000m in 2003 to €9,673m in 2009. After 2009, the budget began decreasing, by percentages ranging between -4.1% in 2010 and -25.6% in 2012. PGE for 2014 and 2015 have increased by 3.6% and 4.2%, leading to a budget of €6,406m. Despite these increases, the PGE for 2015 is lower than the one of 2006 (€6,546m) (ICONO-MINECO: 2014). The foreseen budget for 2014 envisages an increase of €213.9m (3.61%), a quantity that is much lower than the reduced one last year (€461m) (Molero and de No, 2013b). The state budgets include not only direct expenditures and subsidies for R&D but also loans. In fact, in the last few years the share of loans has been increasing, in contrast to that of subsidies, which implies, de facto, an even greater decrease. Considering the growth of the Spanish R&D system, the total funds per R&D personnel (FTE) have changed from €31.9k in 2002 to €41.1k per head in 2009. For 2013, this figure will represent €22.6k per head (€16.2k non-financial) (Molero and de No, 2012c, Molero and de No, 2013a). This is a clear step backwards for the Spanish R&D system. In addition, the non-execution of an important part of the budgets has worsened the situation.

In the period of 2009-2012, between 21% and 45% of the yearly budgets were not executed (Molero and de No, 2012a; FECYT, 2013a).⁴⁰ Since 2008, the total budget not executed is equivalent to €8,661m, which is higher than the total budget for 2011 (Molero and de No, 2012a). COSCE, in their analysis of the PGE on R&D for 2013 (Molero and de No, 2012c, 2013a), warn that the envisaged 80% of the total reduction lies in non-financial funds, and this will have a devastating impact on public research and, especially on basic research. This trend has been maintained despite the increase of the PGE (Molero and de No, 2014a and 2014b).⁴¹ Therefore, it can be considered that, despite the slight increase in the PGE for the last year, the impact of the crisis in R&I investment has been

³⁸ Own calculations with ERAC (2104) figures. See Footnote 43.

³⁹ Data from FECYT (2014) and COSCE reports (expenditure heading 46).

⁴⁰ See Footnote 16.

⁴¹ PGE for 2015 the non-financial funds (subsidies) have decrease in €7m (the increase should be lower as it is consider non-deflated values (Molero and de No, 2014a).

severe, and might have been exacerbated by government's reductions in public investments for R&I.

The percentage of Structural Funds devoted to R&I is increasing (ERAC, 2014; Heijis and di Anselmo, 2013). In the period 2007-2013, a total of €7.8 billion was allocated to research, innovation and entrepreneurship in Spain,⁴² which represents 22.6% of the total FEDER fund for Spain (EC, 2014a). The commitment rate of these EU funds is lower than the EU average (38.4% against 46.6% by 2010) (EC, 2014a). Regarding the Spanish participation in the EU 7th Framework Programme, around 6,400 Spanish researchers have been partners in an FP7 project, with a total EC financial contribution of €1.8 billion, which represents 6.9% of total EC funding up to mid-2012 (EC, 2014a: 255). The success rate of Spanish applicants is 20%, which is lower than the EU average success rate (22%) (EC, 2014a). The EESTI and PECTI aim at increasing the following: the Spanish participation in the EU FP from the current 8.3% to 9%; the returns from public research bodies up to 20%; and the percentage of projects headed by Spanish entities up to 10%. The return levels of Spain from the FP7 have increased from 8.2% in 2010 to 10% in 2012 (ICONO-CDTI: 2014).⁴³ Estimates for the period 2007-2012 indicate that European funds (Structural Funds and FP research funds) represent 19.6% of the public funding, the Structural Funds being 12% (ERAC, 2014: 21). The same sources indicate that the share of Structural Funds in Spain is very low (20%, only higher than the one of Greece) and that the Structural funds for R&D are heavily concentrated in less developed regions, Andalucía being the region with the highest share of these funds (39%) followed by Galicia (19%) (ERAC, 2014: 59).

2.5.2 Project vs. institutional allocation of public funding

The law of 2011 simplifies the allocation of competitive funding for research and innovation by giving the responsibility for the allocation of funds to two main bodies, the new research agency (to be created) and the existing CDTI. The new PECTI plan (2013-2016) clearly states that most of the funds will be distributed through competitive funding mechanisms.⁴⁴ The MINECO, assisted by the secretary of state SSRDI, is responsible for drafting and managing the main R&I instruments. As mentioned, the main funding bodies involved in the implementation of R&I policies are the Spanish Research Agency (to be created) and the CDTI. The Spanish Research Agency aims to be an autonomous entity that will assign R&D funds on scientific merit grounds. The CDTI is a public corporate entity engaged mainly in the promotion of innovation and technological development for companies. Other institutions, such as the ISCIII, also fund research. The Information SICTI is responsible for the data collection and analysis for the monitoring of all policy programmes and instruments of the R&I policy. Considering the public budget for R&D

⁴² Core RTD allocated to Spain from 2007-2013 was €4.2b with a total of €3b of certified expenditure.

⁴³ Funding for projects through FP7 went to 6,432 projects, which involved 11,377 participants and had an EC financial contribution to partners from country of €3.3b. FP6 figures involved 2,830 projects with 5,189 participants and with an EC financial contribution to partners from country of €0.96b.

⁴⁴ PECTI states that "public funds will be allocated on competitive bases. The selection of grants will take into account scientific and technical criteria. Additional technological feasibility and commercial value will be also considered supported by international standards. Criteria will follow transparent evaluation processes based on international peer committees" (PECTI: 4). National programmes will be mainly allocated through competitive processes (PECTI: 14).

(PGE) for 2014 (€6,146m) and its distribution across ministries, MINECO allocates 75% of the budget, followed by the Ministry of Industry, Energy and Tourism (MINETUR) (20%), the Ministry of Defence (MDE) (2.7%), and the Ministry of Education, Culture and Sports (MEDU) (1.5%). Other Ministries, such as the Ministry of Finance (0.2%), represent percentages lower than 1% (ICONO - MINECO, 2014). In addition, several policy measures have tried to increase the competitiveness of the R&D system. For example, the “Severo Ochoa and María de Maeztu centres and units of excellence”⁴⁵ that promote excellence in scientific research by recognising and granting performance-based funding to outstanding research institutions (see below).

The distribution of block funding is different between public research organisations (PROs) and universities. This funding is more important for PROs than for universities. In the case of universities, the regions are responsible for their teaching and operations. Regions distribute institutional funding to universities based mainly on the number of students and teachers and other related criteria.⁴⁶ It is assumed that university academic personnel devote 66% of their time to teaching and 33% to research activities. So one-third of their salaries can be considered as institutional R&D funding. In fact this part of their salaries is considered to be R&D expenditure in the official statistics. The state and regions provide little or no institutional funding for research (block funding) so the rest of research funds come mainly from regional, national and international programmes based on project funding. This project funding is generally distributed through public tendering oriented to broad thematic fields. The finance of R&D activities of PROs is mainly channelled through the state budget (PGE) through MINECO, although other ministries also distribute R&D funds for PROs. Institutional funding in 2013 for PROs was €1,234.7m (7.73% lower than 2012), which is 19.6% of GBAORD (Molero and de No, 2013a; Molero et al., 2011). A substantial part of their funds (based on data for 2007) goes to salaries (40%), operational costs (10%) and investments (17%) while the “operational transfers” – mainly used for research – count for less than 7% of the received block funding (León et al., 2006).

Project funding gained importance within the Spanish R&I system,⁴⁷ but the financial crisis and the reduction of the public budget for R&D has severely affected this funding mode. As mentioned, figures on the share of competitive vs. institutional public funding for R&D are not usually publicly available. However, data provided to the ERAC panel shows that competitive funding (grants and fellowships) of the state budget for R&D has decreased by

⁴⁵ Named “Severo Ochoa centres and units of excellence” in the previous working plan.

⁴⁶ From 1987 to 1993, an “incremental” criterion was applied for funding (based on previous year expenditures and considering changes in teaching and administrative personnel (“*Personal Docente Investigador*” - PDI and “*Personal de Administración y Servicios*” PAS). In 1994, it was applied the “*Modelo 92*” based on unitary cost of personnel applied to the number of students (Puerto Cela, 1994). From 1995, regions (*Comunidades Autónomas*) have been responsible for university funding and applied different versions of these mechanisms (see Pérez Esparrells and Utrilla de la Hoz, 2008).

⁴⁷ In 1989, this form of support accounted for 30% of the R&D-related state budget, while at the beginning of this century this percentage was around 23% of all funds (Sanz, 2005). A more recent study on public research centres (OPIS and Technology Centres) from 2002 to 2007 (Castro et al., 2012) indicates that institutional funding represents about 71% of their funding, while competitive funding represents a percentage of between 24-34%, although there is a high diversity in their funding portfolio. Competitive funding appears to have slightly increased, although the great diversity in funding makes it difficult to estimate whether this variation is significant (Castro et al., 2012).

62% from 2008 to 2013 (ERAC, 2014: 20). Due to the more fixed character of institutional funding, state R&D cuts appear to have particularly affected funds allocated in a competitive funding mode. The approximate share of the competitive funding over the last three years has decreased from 52.1% in 2011 to 36.9% in 2013.⁴⁸

The main programmes for allocation of project funding at national level are included in the national plan (PECTI 2013-2016) and distributed in programmes and sub-programmes. The distribution of percentages across programmes and sub-programmes according to the provisional budget to be distributed by the Nation State Administration (AGE) in 2014 were (see Table I in Section 2.2 for more details): (1) Recognition and promotion of talent and employability Programme (14.4%); (1.1) Sub-programme of Education and training (5.6%); (1.2) Sub-programme of Employability (8.3%); (1.3) Sub-programme of Mobility (0.5%); (2) Promotion of excellence Programme (6.4%); (2.1) Sub-programme of knowledge generation (4.3%); (2.2) Sub-programme of Institutional empowerment (2.1%); (2.3) Sub-programme for scientific and technological infrastructures (0%); (3) Business leadership programme (19.4%); (3.1) Sub-programme for private R&I (11.2%); (3.2) Sub-programme of enabling technologies (4.1%); (3.3) Sub-programme of collaborative R&I (4.1%); (4) Promotion of R&I towards societal challenges (59.9%); (4.1) Challenges and actions (38.8%); (4.2) Strategic Action in Health (3.1%); (4.3) Strategic Action digital economy and society (17.9%).

The funds are allocated through the General Secretariat SICTI. The CDTI distributes R&D funds for firms. Allocation of competitive funds usually follows a peer evaluation process of the proposal, but they normally involve domestic experts. International peer evaluation is less frequent and budget cuts could also reduce the use of such evaluation. The new strategy EESTI (2013-2020) includes international evaluation of competitive funding as one of its 5 basic principles (number 3). In addition, one of its 6 articulation mechanisms (number 5) considers the “harmonisation of criteria and practices of evaluation – ex ante and ex post”, including international peer review. The new PECTI (2013-2016), as it implements the Strategy, also aims at increasing the role of competitive funding and “international peer review”. It states that most of the funds will be allocated through competitive mechanisms. The role of “international peer review” is specifically mentioned in several programmes (e.g. Basic R&D, Human Resources for R&D and Research Infrastructures). For some important programmes (e.g. “Promotion of R&I towards societal challenges”) researchers have to submit a summary in English and can choose to submit the proposal either in Spanish or in English. Some more internationally-oriented specific sub-calls have to be submitted in English (e.g. within the previous working programme the sub-call “International Joint Programming Actions”).

In this regard, the “Severo Ochoa and María de Maeztu” sub-programme is also worth mentioning, as it supports excellent research centres and groups. This sub-programme was launched in 2011 within the framework of the NP (2008-2011). It is aimed at existing

⁴⁸ Own calculations from ERAC (2014) report figures. The share of competitive funding was calculated using the figures for competitive funding (grants and fellowships) against a total (€1,333m in 2013) that includes “Current transfers (OPIS)”, “Fees and current transfers (international infrastructures)”, and “Scientific and Technological Infrastructures (ICTs)”. This total does not include the least important in budget lines “Non competitive funding and awards” and “others” as they were not available in the ERAC (2014) report. Therefore, the share shown is approximated.

centres and units that perform cutting-edge basic research and are among the world's best in their respective areas. The impact and international scientific leadership of these centres and units is essential for their recognition. Accreditation as a "Severo Ochoa Centre of Excellence" or "María de Maeztu Units of Excellence" is valid for four years and includes a grant of one million Euros per year during this period.

In summary, despite the efforts to increase the share of project funding (e.g. EESTI, PECTI), the budget cuts for R&D have particularly affected project funding. The more fixed character of the institutional funding has probably affected this negative trend. Institutional block funding includes salaries of researchers with permanent contracts (public officials) and other fixed operational costs such infrastructures. Temporary researchers are usually hired through project funding programmes. In addition, mechanisms to allocate institutional funding in a competitive mode have not been put in place. Institutional funding is mainly allocated through block funding and performance-based mechanisms are not usually taken into account to allocate these funds. Budget cuts have therefore particularly affected project funding, due to its more flexible character. This has increased competition for project funding among already competitive researchers, thereby making the R&D system less efficient.

2.5.3 R&I funding

Funding streams can be found to cover the entire value creation chain from fundamental research to market innovation, but these are distributed through different programmes and agencies. One of the most important trends in the Spanish policy mix in the last few years has been the clear shift towards innovation policies and knowledge transfer from the research sector to the productive one - together with the increasing importance of competitive funding, the implementation of a more diversified set of instruments, the solution of societal challenges and public procurement. This change can be seen through the changes in the objectives of the strategies and plans, new initiatives, instruments and budget allocation. Spanish national authorities have implemented specific strategies to promote innovation and knowledge challenges. For example, the Spanish Strategy for Innovation set the goals for innovation policies at national level during the period 2010-2015. In addition, a specific strategy and plan for innovation was originally envisaged by the LCTI Law (2011), but finally merged in the current EESTI strategy (2013-2020). The CDTI is the entity that usually manages the national programmes for the promotion of innovation and technological development for companies. In addition, regional authorities implement regional strategies for innovation. Spain implements a large set of instruments for funding R&I for business organisations: low interest credits; tax incentives (including: tax deductions for R&I activities; income reduction for transferring intangible assets – Patent Box; and social security benefits for full-time R&D personnel); and public procurement and risk capital (see below). It is usually difficult to disentangle the funds that go to R&D from the ones that go to innovation. In the provisional budget for R&I distributed by the state secretary SICTI for 2014 and 2013, Public funds for innovation and knowledge transference are mainly included in the "Business leadership programme", which includes three sub-programmes: (1) private R&I; (2) Enabling technologies; and (3) Collaborative R&I. In 2014, it was estimated that this programme would distribute €596m

(approximately 19.% of total funds), distributing €345.1m, €4.1m and €4.1m through the sub-programmes mentioned above (MINECO, 2013).⁴⁹ The main indicators for innovation come from the Community Innovation Survey. Funding for innovation in 2012 represented €13,410m (ICONO-INE, 2014).

Spain has been implementing a large number of support schemes to foster public-private cooperation in R&I. These programmes aim to improve a level of public-private collaboration that was considered low (OECD, 2006; COTEC, 2012; COTEC, 2014). The National Programme (Np) on public-private cooperation was designed to increase this cooperation. This programme was included in the Instrumental Working Line (IWL) “Articulation and internationalisation of the system” of the Spanish National Plan for R&I (NP). In 2012, Np on “Public-private Cooperation” had three instruments: INNFACTO, FEDER-ININTERCONECTA Andalucía and FEDER-ININTERCONECTA INNPRONTA Galicia (FECYT, 2014). In 2012 this programme distributed €493.3 mill., and the three above-mentioned instruments represented 74.4%, 19.6% and 6.1% respectively of the total programme. Compared to 2011, the budget for “Public-private Cooperation” has decreased by 24.6% in 2012. Public-private cooperation has been included in the new policy framework (PECTI 2013-2016) in the “Business leadership programme” (which represents 19.4% of the provisional budget for 2014), in the “Sub-programme of collaborative R&I”, which represents 40.1% of the programme budget (€333.5m), and in particular, through the “Strategic public-private collaboration projects for business development” instrument, which represents 60% of the sub-programme.

The LCTI (2011) has introduced several changes to improve the mechanisms of knowledge transfer: (1) increasing the value of transfer activities (e.g. by detecting research groups whose knowledge could be applied or by increasing the role of OTRIs); (2) promoting the “units of excellence” (art. 33.1); or (3) developing an open-access archive with research results. It encourages the creation of Technology Based Enterprises (EBTs) by allowing researchers to work part-time in private firms created by the organisations in which they are working and by eliminating restrictions on the maximum share ownership of a private company (10%) and the restrictions on being a board member in a private company.

Spain boasts a broad set of policy instruments, mostly based on low interest credits (government direct funding), to stimulate greater R&I. The central government’s budget (PGE) for R&D in 2014 was €6,146m, of which 60.7% corresponded to financial operations (loans) and 39.3% to non-financial operation (subsidies) (ICONO-MINECO, 2014). Considering the funds distributed by the National government through the national plan for R&D in 2012 (€1,846m), a total of 50.8% was distributed through loans and 49.2% through subsidies and repayable advances from the European Regional Development Fund (ERDF) (FECYT, 2014). In 2011, these percentages were 63.4% for loans and 36.6% for subsidies. In addition, the Spanish system of tax incentives⁵⁰ (indirect government funding)

⁴⁹ See footnote 22.

⁵⁰ The current Spanish regulation includes three types of R&D tax incentives for firms (Ministry of Science and Innovation, 2011: 12): (1) Tax deduction for R&D and Innovation activities (ex-ante and ex-post); (2) Income reduction for transferring intangible assets (“Patent Box”) and (3) Social security benefits for full-time R&D personnel. The Spanish system of tax incentives for R&D and Innovation has been one of the most generous among OECD countries for the past few years. The deductions are based on the Royal Decree - Law 4/2004 and are further developed in Law 35/2006; Law 4/2008; the Royal Decree - Law 3/2009 and the Law 2/2011

for R&I has been one of the most generous among OECD countries for the past few years. However, despite the fact that tax incentives are so generous, the bureaucratic procedure for benefitting from these deductions was until recently complex and uncertain. This diminished the incentive effects of the support programme. The Ministry of Finance has indicated that the average annual cost of tax income forgone by the state was €200-300m in 2002-03 and over €300-400m in 2004-08, decreasing to around €200m in the last few years (PGE, 2013). This represents around 3-5% of private R&D expenditure in this period, while support in the form of subventions since 2007 has been around 16-18%.

Public procurement (government direct funding) of innovative goods and services has been increasingly encouraged in Spain. The PECTI Plan (2013-2016) includes the public procurement of innovative goods and services within the Strategic Action of Economy and Digital Society, the Programme of Business Leadership (AEESD 3). In addition, The Council of Ministries (8/07/2011) agreed on setting a 3% target of new investments by the general public administration to be devoted to innovative public procurement. Five tenders are listed in the CDTI web but it is not clear whether the 3% objective has been met.⁵¹

The investments in risk capital, including seed capital, start-up funds and funding for other stages of the business creation, was €1,470.2m in 2012 and represents 0.009% of the Spanish GDP (see Table 1). This has decreased significantly since 2010 (€2,479.7m) by 20.4% in 2011 and by 25.5% in 2012 (ICONO-Eurostat, 2014). In Spain there were about 54 networks and groups of Business Angels in 2009 (OECD, STI Scoreboard 2011, from FECYT). Although Spain has recently designed a large number of support schemes to foster public-private cooperation in R&I and funding streams can be found to cover the entire value creation chain from fundamental research to market innovation, they are distributed across programmes and agencies.

The new law LCTI (2011), the new EESTI (2013-2020), and PECTI (2013-2016) also address these challenges. The new Entrepreneurship and Internationalisation Support Act (Law 14/2013 aims at improving finance for entrepreneurs and reducing the administrative burden for starting a new business.

The role of innovation is gaining importance in the Spanish Policy mix over the last years. The new EESTI strategy (2013-2020) and PECTI plan (2013-2016) follow previous efforts in this direction (e.g. INGENIO 2010, National Plan for R&D (2008-2011) and e2i) encouraging the creation of NTBFs and university spin-offs; the promotion of R&D projects in general and more specifically public-private cooperation in long term strategic projects (e.g. Sub-programme for collaborative R&I – INNPRONTA in the previous plan); policies to foster human capital, such as the incorporation of PhD holders into the private sector; offering extra financial support for R&I in general and specifically for risk capital, paying

and Royal Decree 475/2014). The tax reform approved in November 2006 brought important changes. First, it enabled up to a 40% reduction in social security taxes of R&D staff working for firm. Second, following a trend of reducing corporate taxes, R&D and Innovation corporate tax credits were also reduced. In 2009, the deduction procedure was simplified; cancelling the time limit of 2 years to deduce taxes for R&D investments. Moreover in 2011 the deduction for innovation was increased from 8% to 12%, but this increase has been cancelled for 2012 and 2013. The Royal Decree 475/2014 with entered into force on September 2014 allows to benefit from R&D deductions retrospectively for 2013.

⁵¹ No specific information on public procurement is found in the provisional Budget published of the working plan of the PECTI for 2013.

attention to societal challenges and public procurement for the acquisition of innovative goods and services. The new Entrepreneurship and Internationalisation Support Act (Law 14/2013) also aims at improving finance for entrepreneurs and reducing the administrative burden for starting a new business (see 2.2).

2.6 Smart Specialisation (RIS3)

The concept of “smart specialisation” is gaining importance in the Spanish R&I system. Smart specialisation entails the need to prioritise specific areas of research and innovation based on the requirements and resources of regions. The new EESTI strategy (2013-2020) includes the concept in one of its 6 priority axes (Priority 5) as the tool for increasing the competitiveness of the regional systems of innovation. The new PECTI plan (2013-2016) also mentions this concept. However, these documents do not clearly specify whether it will be a national, regional or a shared competence.

Many other regional authorities are using the concept of “smart specialisation” to design or develop their regional strategies. One piece of evidence of the success of the concept is that all regional authorities or “*Comunidades Autónomas*” (CAs) have registered for the Smart Specialisation Platform (S³P), which “assists Member States and regions to develop, implement and review Research and Innovation Strategies for Smart Specialisation (RIS3)” (RIS3: on-line). Three CAs have been peer reviewed in this context (Aragon, Castile and Leon and the Basque Country). In addition, Navarre and the Balearic Islands have been subject of case studies on smart specialisation (Ortega-Argilés, 2012).

All Spanish regions have developed and made public their RIS3 strategies: [Andalusia](#), [Aragón](#), [Asturias](#), [Cantabria](#), [Castilla-la Mancha](#), [Castile and León](#), [Catalonia](#), [Comunity of Madrid](#), [Valencian Community](#), [Extremadura](#), [Galicia](#), [Balearic Islands](#), [Canary Islands](#), [La Rioja](#), [Navarre](#), [The Basque Country](#) and the [Region of Murcia](#). Strategies appear to have been developed following a similar structure, which includes financial requirements, measures to stimulate private investment, and monitoring and evaluation mechanisms. A more accurate statement about how these aspects have been envisaged in the RIS strategies would require a detailed content analysis of these documents. The structure of Navarre and The Basque Country appear to have developed more independently of this common structure. However, this does not indicate that the previous aspects have not been considered. Navarre had developed its strategy in advance (see. Ortega-Argilés, 2012) and The Basque Country had implemented this rationale a long time ago⁵² (see Aranguren-Querejeta et al. (2012), being the region with the highest R&D investment per GDP in Spain (2.2% in 2012) and with the lowest level of unemployment (14.9% in 2012) (INE-2013). Priorities for future areas of specialisation do not appear to have been identified yet at national level. The national Strategy (EESTI) does not specify them. The national strategies and plans are defined through instrumental priorities rather than through thematic priorities, which could make the prioritising process more difficult (Zabala, 2012; Heijs and di Anselmo, 2013).

⁵² In the early 1980s, this region started a series of policies that were designed and implemented in co-operation with the main political, economic and social stakeholders, and it has successfully transformed its economic structure.

The Network of Public Policies for R&I ([REDIDI](#)) has a role in disseminating and coordinating national and regional RIS3 strategies. This network has a specific section devoted to RIS3 dissemination and organises working groups on RIS3 to improve coordination at the national, regional and European levels. In addition, the [RedIRIS](#), an academic and research network, aimed at improving communication, could also help to apply strategies of smart specialisation.

The information system SICTI introduced by the new LCTI Law (2011) was aimed at improving national and regional coordination in gathering data. This system could offer a mechanism for adequately monitoring and evaluating RIS3 strategies. The Spanish Foundation for Science and Technology has implemented the Spanish Observatory of R&D (ICONO), a web platform of indicators with increasing number of indicators available at international, national and regional levels. ICONO provides objective data about more than 120 R&I indicators and analyses science, technology and innovation policies and strategies. The observatory contributes to a better understanding of the Spanish R&I system, thus improving its accountability and transparency. This represents a positive trend and could help to improve the number of indicators available at regional level. Under the mandate of the MINECO, the FECYT have been collecting data from regional and national programmes since 2009, in order to foster a better coordination for R&D policy between the different administrations. Heijs and di Anselmo (2013) point out that some indicators were not available at regional level, which has made the designing, monitoring and evaluation process of RIS3 strategies more complicated. REDIDI has created a document with [examples of RIS3 indicators](#) and data sources.

2.7 Evaluations, consultations and foresight exercises

The R&D policy evaluation system could be regarded as moderately developed, with a need for improving its evaluation culture and its effectiveness (ERAC, 2014; Heijs et al., 2011; Heijs and Martinez, 2011; Eparvier, 2009). The most recent peer review exercise of the Spanish R&D system made by the ERAC states that there is “a lack of an effective system of evaluation at policy, institutional or research quality levels and only a partial existence of a policy intelligence system” (p. 4). This report considers the need for reinforcing a monitoring and evaluation system as the second cross-cutting challenge necessary to ensure policy impact (ERAC, 2014: 73). The need to improve the evaluation culture is recognised by the EESTI strategy (2013-2020), which sets out the intention to reinforce a culture of policy monitoring, accountability and evaluation of the system. The strategy also offers a list of indicators that are aimed to measure progress towards specific objectives. However, the list of indicators is not sufficiently in line with the policy objectives and it does not appear to cover adequately private R&D activity or the role of the Autonomous Communities in the R&D system (ERAC, 2014; Heijs and di Anselmo, 2013). It is also important to recognise the role of the Spanish Observatory of R&D (ICONO), managed by the FECYT, in establishing a user-friendly web platform with an increasing number of indicators available at international, national and regional levels. ICONO provides objective data about more than 120 R&I indicators and analyses science, technology and innovation

policies and strategies.⁵³ Although there are some limitations on the availability on the policy-relevant indicators on public funding for R&D (e.g. national public funding for R&D across funding modes⁵⁴ (ERAC, 2014), the observatory contributes to a better understanding of the Spanish R&I system, thereby improving its accountability and transparency.

Under the mandate of the MINECO, the FECYT carried out yearly reviews of the R&D public calls for proposals from 2006-2010 as SISE and later as Annual Reports for R&I. Currently, the Ministry has decided to perform these reviews within a longer time frame. The CDTI evaluates most of the business-oriented instruments. However, these are mainly reports on how the funding was distributed across instruments and they usually lack any assessment of the quality and efficiency of the funding mechanisms. Strategies and plans are increasingly based on some of the evaluation analyses, but these are not always publicly available.⁵⁵ There are nonetheless a range of evaluation studies carried out by different stakeholders (e.g. CDTI, FECYT⁵⁶, AEVAL⁵⁷, and the Institute for Fiscal Studies or COSCE). Most of them analyse specific instruments or programmes at national level. Additionally, PhD students or researchers conduct other studies using the publicly available databases (see Valadéz et al., 2011; Herrera, 2008; Herrera and Heijs 2007). However, most studies analyse specific isolated aspects or programmes. There is a lack of systematic reviews offering a cost benefit analysis or evaluating whether the implementation was efficiently carried out. Therefore, despite the improvements, there is not an effective monitoring and review system in place, as full use is not made of output indicators, international benchmarking, ex ante and ex-post evaluation tools or impact analysis. Data on funding through R&D programmes is made publicly available, but with significant delays, and therefore it is difficult to assess whether this information is used as input for the next funding cycle.⁵⁸ In general terms, the policy evaluation system would benefit from a better integration into the policy system, and from a generalisation and standardisation of a common evaluation system with international evaluation standards working at different levels (programmes, institutions, etc.) (ERAC 2014: 74).

IN 2014, the European Research and Innovation Area Committee (ERAC) carried out the most recent peer review evaluation of the R&D Spanish system. After a request by the

⁵³ ERAC suggested including the international and regional availability of data for increasing the benchmarking capabilities of the platform.

⁵⁴ Other data limitations pointed out are: national public funding of domestic R&D projects by R&D funding agency (national, intermediary, regional); national public funding of domestic R&D projects, distinguishing between academically-oriented, innovation-oriented or policy-oriented project funding; and public funding of R&D, distinguishing between R&D contracts, public procurement, R&D grants, loans for R&D and government intramural R&D.

⁵⁵ The PECTI mentions the weaknesses of the previous National Plan (p. 6), but it does not refer to the analysis from which these weaknesses were identified. It may be based on the SISE reports that evaluate the implementation of the National Plans. These reports were carried out on a yearly basis from 2006 to 2010.

⁵⁶ For example, they elaborate the SISE reports that report on and evaluate the implementation of the National Plans. The report for 2010 is the last year available since it was the last year for its mandate.

⁵⁷ The Spanish Agency for Evaluation (AEVAL) carried out the evaluation of Ingenio 2010 (AEVAL, 2008), but no other evaluation on R&D appears to have been carried out.

⁵⁸ For example, at the time of writing this report, data on public R&D expenditures through national public programmes are only publicly available for 2012. The work programme that established how the funds of the PECTI were going to be distributed for 2014 was published in December 2014.

Spanish authorities in November 2013, the ERAC established a group of international peers that worked in collaboration with experts from the European Commission and the MINECO during the first semester of 2014 and published the [“ERAC Peer Review of Spanish Research and Innovation System Final Report”](#) in August 2014. The key findings of the report points out that the Spanish research system is unequal in the distribution of its levels of excellence; that it is limited by a fragmented system of governance; that it has significant institutional rigidities, preventing an effective flow of people and knowledge; and that it lacks an effective system of evaluation at policy and institutional levels. The report recognises that the LCTI Law (2011) and that the EESTI (2013-2020) have good objectives, but that it lacks effective paths towards its implementation. These paths are especially needed to address the dualised character of the research system (with high quality peak performance but low average); its integration with the business sector (with a small number per capita of business with R&D innovation capabilities); and its fragmented system of governance (with national and regional capabilities).

The report includes the following ten key recommendations (ERAC, 2014: 4-9):

1. “It is clear that Spain's R&I system needs increased resources but these must go hand in hand with structural reform for a more efficient and effective use of public investment. This will ensure a faster and more sustainable recovery for the Spanish economy. The additional resources should be used exclusively to incentivise reform”
2. “Human resources are the most pressing problem and rapid action is needed”
3. “Institutional reform is critical”
4. “Research institutes and universities need to be subject to an assessment system that influences resource allocation both directly and indirectly. There is also a need to increase the proportion of competitive funding”
5. “A new level of coordination between actors is required for effective innovation. We propose national consortia, termed Strategic Innovation Arenas”
6. “Bringing more business actors into the innovation system is critical”
7. “A market and a culture for innovation”
8. “The need for an autonomous agency to implement the reform programme”
9. “Incentivising regional synergies in support of business and business creation”
10. “Effective monitoring and evaluation to support evidence-based policy”

The ERAC report accompanies its arguments and recommendations with interesting national and international examples on how to address the challenges. At the time of writing this report, it is difficult to judge the impact of this report, as it was only published in August 2014.

In February 2013 and by request of the Ministry of Education, Culture and Sports, a peer review evaluation of the university system was published, under the title [“Proposal for the reform and improvement of the efficiency and quality of the Spanish University System”](#) (MEDU, 2013a). This report recognises the need for increasing the quality of the research

done at universities and to improve the match between education and the economic system in order to increase the international impact of research, increase competitiveness and reduce the high levels of unemployment. It presents recommendations in 5 areas: (1) selection of university personnel; (2) evaluation of the quality of the universities; (3) university governance; (4) funding; and (5) university curricula. Regarding the first area, the recommendations aim at improving the selection of the personnel, increasing tenure-track positions, avoiding endogamy, promoting internationalisation and excellence. Recommendations for the second area aim at establishing an evaluation system for universities. Measures to increase flexibility are pointed out for the governance system. Increased and diversified funding is recommended. Finally, measures to reduce the number of degree plans offered by multiple centres are covered in the fifth section. At the time of writing this report, it appears that no specific measures have been taken to implement these recommendations.

The [Draft of the Spanish Strategy for Science and Technology and Innovation \(2013-2020\)](#) (EESTI) and the [Draft of the Spanish State Plan for Scientific and Technical Research and Innovation \(2013-2016\)](#) (PECTI), were the subject of public consultations in October and December 2012 (see Country Report for 2013 EW, 2014b).

The [Observatory for Industrial Technology Foresight](#) was created in 1997 by the Ministry of Industry, Tourism and Trade to provide insights into the policy decision-making process regarding technology at both public and private levels. Its more recent report was about the anticipated impact of biotechnology in agriculture and farming for 2025 (Ruiz Galán and Rodríguez, 2013) and this can be found on the FECYT webpage. According to the [Global Foresight Outlook 2007](#), a total of 47 exercises have been mapped in Spain. Most of these use panels of experts, literature reviews and Delphi exercises as methodologies. They tend to be nationally-oriented, with a small number of participants (fewer than 50 members); and they tend to produce policy recommendations, analyses of trends and key technologies.

Some institutions, such as the Central Bank of Spain or the Ministry of Finance, publish analyses based on macroeconomic models, to assess R&D impact on economic growth (e.g. Estrada and Montero, 2009; Freire-Serén, 2000). However, these results tend not to represent the official statements by these institutions. Therefore, it could be said that there is no a macroeconomic model at member state to assess R&D impact on economic growth.

3. National progress towards realisation of ERA

3.1 ERA priority 2: Optimal transnational co-operation and competition

The involvement in joint activities is part of the efforts for increasing the internationalisation and orientation towards societal challenges of the Spanish R&I system. The new PECTI plan (2013-2016) follows previous efforts and encourages the internationalisation of the research system.⁵⁹ The new EESTI strategy (2013-2020) identified as one of the challenges of the system the “Low internationalisation of R&D actors (especially firms)”. The 2014 and 2013 working PECTI plans include internationalisation objectives in the “Promotion of excellence” programme – Sub-programme of Institutional empowerment (€206.8m in 2013 and €63.3m in 2014; -69.4% reduction) and in the “Promotion of R&I towards societal challenges” programme (e.g. Europe Networks -€2.5m in 2013 not launched in 2014) for research and in the sub-programme “Private R&I” (e.g. “CDTI INTERNACIONALIZA” projects - €2m in 2013 and €2.5m in 2014) for the internationalisation of firms (MINECO, 2013, 2014).⁶⁰ In addition, the new calls for “Europe Managers”, “Europe Researchers” and “EMPLEA” all devoted to promoting R&D management (MINECO, 2013) might increase the Spanish participation in international calls and improve the alignment with other European research agendas. Strategies for Smart Specialisation (RIS3) might help to improve the alignment of regional, national and European research agendas and could improve joint activities, as they generally aim to increase this alignment and increase internationalisation. Similarly, the solution to major societal challenges is receiving growing attention in the Spanish R&I policies. The EESTI (2013-2020) and new Plan for Scientific and Technical Research and Innovation (PECTI) (2013-2016) follow the efforts of previous measures⁶¹ (see section 4.3). Considerable efforts have been made to facilitate the convergence of national and regional research agendas (e.g. smart specialisation and EESTI). These could facilitate future synergies between regional, national and international programmes.

⁵⁹ The National Plan included an Instrumental Working Line (IWL) devoted to the “Articulation and Internationalisation of the system” where projects directed towards the creation of networks and linkages are included. This IWL represents the 21.5% of the total funds and includes the Redes and Public-private Cooperation Np: Redes aims to help technological platforms and clusters to improve cooperation with two main instruments: AEI and INNFLUYE focused respectively on clusters and technologic platforms. In 2011, the Np of “Public-private Cooperation” distributed €654m, which was 91% of the IWL (FECYT, 2012). It had two main instruments: INNPACTO and INNPRONTA. INNPACTO aims at facilitating knowledge transfer and innovative R&D. Its projects are aimed at creating innovative firms, encouraging innovation in existing firms and improving the technological balance in the country. It distributed 84.2% of the funds programme (21.3% subsidies). INNPRONTA focuses on big projects of strategic industrial research (32.2% of subsidies) (FECYT, 2012).

⁶⁰ The sub-programmes and provisional budgets are included for illustrative purposes, to show some of the programmes in the area. They do not aim to evaluate how the objectives set by the strategy and plan have been met. See section 5 for an assessment of the policy mix.

⁶¹ The previous E2i-Strategy (2009) and the new Law on Sustainable Economy (March 2011) include a focus on sustainable development and societal challenges such as clean energy and biotechnology. The new strategy includes eight major societal challenges (see Box 1: 18).

The Spanish R&D system is moving towards a better alignment with the European agenda. For example, the new plan states that “the structure of the strategy represents an effort to improve the alignment of the Spanish objectives with the ones of the European Union in R&I policy” (PECTI: 4). As the plan implements the strategy by setting its priorities, programmes, coordination mechanisms, costs and sources of funding it could be said that national funding appears to take into account what is being done in other European countries. However, it is difficult to determine to what extent research agendas are designed taking into consideration what is being done in other European countries.

To control the allocation of funding to research areas, several European countries carry out ex-post evaluation. This practice is not very common in Spain (Molas-Gallart, 2012). However, the new EESTI and PECTI aim at promoting ex-post evaluation. As mentioned in section 2.5.2, evaluation procedures are envisaged as the EESTI aims at “harmonising the criteria and practices of evaluation – ex ante and ex post”. The new PECTI (2013-2016), as it implements the Strategy, also aims at increasing the role of ex-post evaluation. However, it is difficult to know whether an ex-post evaluation has been carried out.⁶²

Spain has been participating actively in different joint activities (e.g. ERA-NETS, Joint Programming Initiatives (JPI), Joint Technology Initiatives (JTI)). The PECTI includes specific “Joint programming actions”. This is included in the sub-programme “Challenges and Actions” of (4) the “Promotion of R&I towards societal challenges” programme (See Table I section 2.2). This action is aimed at supporting joint research projects that have been positively evaluated and selected in joint international calls in which MINECO is involved (ERA-NET, JPI, JTI, etc.). It has a budget for 2014 of €5.1m, representing 0.4% of the “Challenges and Actions” sub-programme (€1,194m). Compared with the budget of 2013, the action was reduced by 8.9% in 2014.

Reported joint actions at national level include initiatives carried out through: Article 185⁶³, ERA-NETS, INCO-NET, COST, ERA initiatives (Joint Technology Initiatives - JTIS, Joint Programming Initiatives -JPIS, Public Private Partnerships - PPPS, European Innovation Partnerships - EIPS) and SET-Plan. Spain participates in [four programmes based on Article 185](#): Ambient Assisted Living (AAL); the European Development Clinical Trials Partnership (EDCTP); the European Joint Programme dedicated to the research and development in small and medium-sized enterprises (EUROSTARS); and the European Metrology Research Programme (EMRP).⁶⁴ MINECO reports on [28 ERA-NETS initiatives](#). [7 INCO-NET projects](#);

⁶² This would require all the different calls to be checked. As Molas-Gallart (2012: 10) indicates, “there are no evaluations of specific program outputs or outcomes; the National Plan sets very general targets for the whole of the Spanish innovation system, many of them referring also to inputs to the innovation system (percentage

of R&D/gross domestic product, growth in firms’ R&D, etc.)”.

⁶³ “Article 185 of the Treaty on the Functioning of the European Union (TFEU) [ex Article 169 of the Treaty establishing the European Community (TEC)] enables the EU to participate in research programmes undertaken jointly by several Member States, including participation in the structures created for the execution of national programmes” ([cordis](#)). Therefore, Initiatives based on Article 185 are Public-Public Partnerships between Member States (and Associated States) and the EU.

⁶⁴ Due to the Spanish system of governance, information on joint activities is spread among national and regional authorities, thus making it difficult to determine the degree of Spain’s involvement in these activities. Similarly, this national and regional fragmentation makes the alignment of research agendas more difficult. The LCTI includes several elements for a partial solution to the legal barriers for joint programming and access to research infrastructures (Art. 44 and additional provision 17).

Spain chairs 39 COST actions and is involved in 1077 other actions ([COST webpage](#)). ERA initiatives include: [6 JTIS](#); [JPIS](#); [PPPS](#); [5 EIPS](#); [SET-Plan and IIEs](#).⁶⁵ A study on Joint and Open Research Programmes (JOREP) shows that Spain devotes more than 4% of its GBAORD to joint programmes including the European Space Agency (ESA) ([JOREP](#), 2012). ESA initiatives represent the highest volume, followed by other European initiatives and bilateral agreements.⁶⁶

Due to its traditional relationship with Latin America, Spain has several cooperation programmes with this region. One of the most outstanding ones is the “Ibero-American Programme of Science and Technology for Development” (CYTED) for multilateral cooperation in the following areas: Agro-Alimentation, Health, Promoting Industrial Development, Sustainable Development, Global Change and Ecosystems, ICT, Science and Society, and Energy. Moreover, the Spanish government has several general bilateral cooperation agreements with countries outside Europe (such as Canada, China, India, Korea, USA and Japan). Besides these general programmes, Spain also has bilateral cooperation programmes in some specific fields with Brazil⁶⁷ and Argentina.⁶⁸ The cooperation programmes refer to some broad fields but also address some of the major challenges.

3.2 ERA priority 3: An open labour market for researchers. Facilitating mobility, supporting training and ensuring attractive careers

3.2.1 Introduction

Spain is characterised by a highly regulated market for researchers, with low levels of institutional autonomy for their management, and a dual labour market for researchers (civil servants vs. non-civil servants). Permanent staff at universities and public research institutions generally have generally a civil servant status (Mora, 2001) (see section 3.2.2 for permanent contracts with no civil servant status, such as, “professor contratado doctor”). There is no room for salary negotiations. Salaries follow fixed scales with small variations due to productivity complements. Low departmental autonomy in the management of human resources makes “internal labour markets” predominant (Cruz Castro & Sanz-Menéndez, 2011). The existence of this dual labour market has caused the non-permanent researchers in particular to suffer the consequences of the budget reductions in R&D, thus making human resource management the most urgent problem of the Spanish research system (ERAC, 2014).

The number of people employed in R&D activities in 2013 was 203,612 (FTE) (342,901 Head Count in 2012⁶⁹), 1.2% of total employment (Eurostat, 2014).⁷⁰ The impact of the

⁶⁵ Information extracted on 12 December 2014. This might not be up to date, and includes initiatives from the 6th Framework Programme.

⁶⁶ Access to CIRCAB was not possible.

⁶⁷ Biotechnology, renewable energies, process engineering, nano-technology and health.

⁶⁸ Biomedical, Forensic and Vegetal Genomics, and Bioinformatics.

⁶⁹ No data more recent than these were available in HC at the time of this report from Eurostat.

⁷⁰ Figure lower than the EU-28 average of 1.25.

crisis in R&D personnel has been significant. After increasing by more than 65% from 2002 to 2010, this number decreased in 2011 by 3.1, in 2012 by 2.9, and in 2013 by 2.5, coming back to total figures similar to the ones of 2007 (Eurostat, 2014). A total of 42.8% employees were working in the private sector, 37% in HEIs, 20% in PROs and 0.2% in the private non-profit sector, based on FTE data for 2012 (INE). Human resources in science and technology (HRST) as a share of the labour force in 2012 was 40%, which is below the EU-27 average of 41.4% (Eurostat, 2014). The number of PhD holders in Spain is increasing, having risen from 6,944 PhDs awarded in 2007 to 10,531 in 2012. The unemployment rate among PhD holders has also increased, from 1.7% to 4.7% in 2012 (MEDU, 2013b), which indicates an imbalance between the supply and demand for researchers. In addition to the increasing unemployment levels, there is more evidence indicating that the economic crisis and decreasing public investments in R&I are making the labour market situation for researchers in Spain very difficult, especially for young researchers. For example, the CSIC has reduced its PhD training contracts (*Junta de Ampliación de Estudios – JAE*) from 2,045 in 2008 to 300 in 2013. The number of employees decreased from 12,928 in 2011 to 11,582 in 2013 and that of grant holders from 618 to 435.⁷¹ In addition, there is an indication of an increasing temporariness and aging of the R&D personnel. For example, the ratio of temporary vs permanent personnel at the CSIC changed from 1:10 in 1986 to 12:10 in 2011 (*Fundación 1 de mayo*, 2014). Public functionaries (civil servants) decreased by 2.5% from 2012 to 2013, while temporary contracts decreased by 16.7% (*Fundación 1 de mayo*, 2014).⁷² A total of 58% of the researchers in the CSIC are over 49 years old (*Fundación 1 de mayo*, 2014).

3.2.2 Open, transparent and merit-based recruitment of researchers

As mentioned, Spain has a dual market for researchers (civil servants and non civil servants) with different regulations and rights. The University Law (LOU), the regulations of Public Research Organisations and all the legislation governing access to “civil servant” status, including Art. 103.3 of the Spanish Constitution, regulate access to the different research positions in the Spanish R&I system.⁷³

At university level, research and teaching personnel civil servants include two main categories: (1) “*Catedráticos de Universidad* (CU)” –the highest-ranking category equivalent to Professor – and (2) “*Titulares de Universidad*” (TU).⁷⁴ In 2012, there were 11,748 CU and 30,876 (TU), giving a ratio of CU:TU of 1:2.6 (MEDU 2013a). Non civil servants at university

⁷¹ According to the institution declarations to the press (18.10.2013): http://sociedad.elpais.com/sociedad/2013/10/18/actualidad/1382111759_201200.html

⁷² In 2013, a total of 5,664 were public functionaries, 4,800 temporary contract and 1,171 “laboral personnel” (they have a civil servant status, but they are not public functionaries).

⁷³ The [Law 4/2007](#) modified the [Law 6/2001](#) (LOU) in the Access of University personnel, changing the “habilitation” system for a national “accreditation” system, which is necessary to participate in the recruitment process “concur” to access to university personnel. Universities are responsible for launching the call according to their own regulation. In addition, the [Royal Decree 1312/2007](#), the [Royal Decree 1313/2007](#). The role of the universities is regulated by the [Law 30/1992](#), [Royal Decree 774/2002](#) and the [Law 7/2007](#) that regulates the Public functionaries staff regulations

⁷⁴ Two other categories could be included: “catedráticos de escuela universitatia (CEU)” and “Titulares de escuela universitaria” (TEU). In 2012, there were 1411 (CEU) and 7066 (TEU). In addition, about 1095 “interinos” – workers that are occupying a civil servant position temporarily- should be considered.

level include: (1) “*Profesorado contratado doctor*” (Art. 52) with a permanent contract but without a “civil-servant” status. In 2012, this category included 8,556 researchers and represents 15% of the permanent research workers at universities (MEDU 2013a). Finally, there are about 42,266 research workers with temporary contracts (mainly “*asociados*” (Art. 54)). This dual-market also exists in Public Research bodies. “Civil servants” at PROs include from the highest to lowest rank: (1) “*Profesor de investigación*”- research Professor; (2) “*Investigador científico*” (3) “*Científico titular*”. Non civil servants include “*personal laboral*”.

The availability of civil servant positions varies across time, with periods of high availability to others with high scarcity (MEDU 2013a), making the career of a researcher in Spain erratic with opportunities to promote highly dependent on the availability of permanent positions rather than on the academic merits.⁷⁵ The recruiting and promotion depends on the internal labour markets (Cruz-Castro and Sanz-Menendez, 2011). Currently, this dual market is negatively affecting young researchers for several reasons: (1) availability of permanent positions (civil servants) is very limited, due to Royal Decree-Law 20/2011 to correct the public deficit;⁷⁶ (2) offers are also limited, due to the high number of positions occupied during the expansion of universities across the regions in previous decades (Mora, 2001); (3) lack of resources have also limited the availability of temporary positions, with budget cuts being applied particularly to project funding, which suffered a -62% reduction from 2008 to 2013 (see section 2.5.1); and (4) access to research funds and other rewards favours researchers with permanent positions. For example, a programme for basic R&D (“Promotion of R&I towards societal challenges” 2013) required researchers to have a contract for the entire duration of the project, making it very difficult young researchers to apply for funds under this programme (see next section).

The LCTI Law (1st June 2011) replaced the so-called Law of Science of 1986 and modifies governance and human resources for R&D. The LCTI includes four types of private (non civil servant) labour contracts: (1) to carry out a PhD degree (four years maximum with minimum wages) (Art. 21); (2) “to grant access” (five years and maximum of 80 hours of teaching) (Art. 22); (3) for researchers working on research projects (D.a 23a); and (4) for distinguished researchers or scientists, “of great prestige” who will be able to occupy key positions in management or in “important” programmes (which can be permanent) (Art.23). The implementation of the pre-PhD contract was delayed till 2014 and the implementation of the other ones could be conditioned by the State budget and public employment supply. Moreover, the LCTI has created a unified professional career. The different official professional scales for scientists with a civil servant status in public research organisations (PROs) will be merged into three, comparable to those of the Spanish National Scientific Research Council (CSIC): (1) research professor; (2) scientific researcher; and (3) permanent scientist. This merging facilitates staff mobility between the PROs. The LCTI also improves several aspects of researchers’ careers. The replacement of the 2+2 system (two years scholarship and then a two year contract) by a four-year employment contract implies the full recognition of certain rights such as unemployment benefits and maternity leave. In

⁷⁵ See Villaroya et al. (2007), EW (2014b) and EC (2013c) for data and other aspects related to the situation of female researchers.

⁷⁶ As mentionend, the replacement rate from retirees has been set in a 10% from 2011 to 2014. The government has announced that this rate will be increased to a 50% in 2015.

addition, the LCTI improves mobility between private and public organisations by allowing extended leave for a maximum of 5 years and partly reducing the incompatibility with working in private firms.⁷⁷ It is difficult to assess to what extent the LCTI has changed the labour market for researchers as no evaluations have been carried out. The research community was expecting the law to implement a “tenure-track” contract to facilitate access by young researchers to a permanent research position. However, it appears that the “access contract” does not meet this requirement, and instead is another type of contract that does not improve the precarious situation of young researchers in Spain. A flexible and competitive system for the management of human resources is a constant demand by the research community (See Country Report EW, 2014a). Similarly, the limited implementation of the contract for “distinguished researchers” has reduced the effectiveness of the LCTI to change the labour market for researchers.⁷⁸

Within this legal framework, research institutions have a reduced level of financial autonomy, which coexists with an important level of autonomy in other areas. “University Autonomy”, for example, is protected by the Spanish constitution and implies a broad level of self-governance. On an individual level, researchers at universities enjoy high levels of freedom to select their research topics and organise their schedule, and HEIs and PROs have high levels of autonomy to organise their thematic priorities. However, they face important limitations on recruiting new researchers, as salaries or other payments are strictly regulated and pre-defined by national authorities (Mora, 2001). Departments do not have human resource autonomy, which favours “internal labour markets” (Cruz-Castro & Sanz-Menendez, 2011). When a researcher leaves a department, the position is lost and vacancies need to be re-negotiated at university level. Most financial resources for universities come from the regional public budgets and there are no clearly established rules for assigning the number and types of positions available. The involvement of the private sector in the governance bodies of HEIs and PROs is very small. The Social Council – with a representation of the different stakeholders in society – exists by law in all universities. However, their role is marginal or symbolic, due to the lack of tradition and culture in this kind of organisation as well as the lack of a well-defined legal framework that would stipulate their functions and powers.

The recruitment process for researchers in the Spanish R&D system is formally open, but tacit mechanisms favour “insiders” (students or researchers from the same university, faculty, or even the same department).

Despite this informal state of things, candidates from the European Union officially have full access to research and teaching positions. Vacancy announcements usually include job profile, skills, competences and eligibility criteria. Information on the selection process and criteria is also usually available to candidates. However, tacit mechanisms behind the formal process make it difficult for outsider to access research positions (Fernandez

⁷⁷ It allows researchers to work part-time in private firms created by the organisations in which they are working and by eliminating restrictions on the maximum share ownership of a private company (10%) and the restrictions on being a board member in private companies. It modifies the previous Law of Sustainable Economy (Law 2/2011) to allow researchers to profit from their patent earnings

⁷⁸ For example, it is envisaged that the CSIC will hire next year, for the first time, under this contract to 17 researchers. A very small figure considering the size of the institution and the number of researchers that are currently under a Ramón y Cajal contract and need to be renewed with a permanent contract.

Esquinas et al., 2006: 167). Frequently, the timescale established between vacancy publication and the deadline for applications makes it difficult for outsiders to apply. The institutes or departments can influence the composition of the members of the selection panels and establish ad hoc selection criteria. Selection panels for permanent position include national external members, whereas international external members are rare. Applicants have the right to receive feedback on the results of the requirement, as well as having the right to appeal against the decision. However, the vagueness of some criteria (e.g. “suitability for the job”) allows tacit mechanisms to be exercised. Therefore, the degree of openness of the selection process depends on the interests of the department and research organisations. However, the increasing competition of the research system and the implementation of some measures appear to have formally and informally opened up the system (e.g. accreditation⁷⁹).

Since 2001, there has been a requirement to have official recognition or accreditation in order to access an academic position (some temporary and all permanent).⁸⁰ The National Agency for Quality Assessment and Accreditation (ANECA) evaluates research and teaching activities and provides accreditation at national level for universities through the Evaluation of the Academic Personnel Programme (PEP) and the ACADEMIA programme. Similar evaluations are implemented at the regional level.⁸¹ University non-civil servant contracts are evaluated by the PEP programme of ANECA and includes the job titles of “*Profesor Contratado Doctor*”, “*Profesor Ayudante Doctor*” and “*Profesor for Private Universities*”. In 2013, the PEP programme carried out 7,717 accreditations, of which 64% were positive. Humanities had a lower success rate with 54% of positive answers (ANECA-PEP, 2013).⁸² The ACADEMIA programme grants accreditations for “*Titulares de Universidad*” and “*Catedráticos de Universidad*”. The ACADEMIA programme carried out 3,588 accreditations, of which 65% were positive. Health and Social Sciences had a lower rate of positive answers with 54% and 56% (ANECA-ACADEMIA, 2013).⁸³ The high number of Teaching and Research Personnel (PDI) (*Ayudante doctor* and *Contratado doctor*) with positive evaluations, compared with the offer of positions, indicates also the mismatch between supply and demand in the labour market for researchers (18,908 as opposed to 2,936 for PAD and 16,342 as opposed to 7,882) (ANECA, 2014). The accreditation process is very bureaucratic, making access by foreign researchers more difficult.

In addition, some language barriers exist. Sometimes, positions require an advanced knowledge of Spanish or other regional languages (such as Catalan or the Basque language). The importance of these regional languages in the evaluation criteria for

⁷⁹ The National Commission for Evaluation (CNAE) has recently slightly changed its criteria for the evaluation of university and CSIC personnel (BOE 01.12.2014).

⁸⁰ According to [Law 4/2007](#), which modified [Law 6/2001](#), [Royal Decree 1052/2002](#) and the [Resolution of 18.02.2005](#) for temporary positions. Permanent positions are regulated by [Royal Decree 1312/2007](#).

⁸¹ The regional evaluation agencies are: DEVA-ACC (Andalusia); Madrid+d (Madrid); ACCUEE (Canary Island); ACSUCYL (Castille and Leon); ACSUG (Galicia); ACUCM (Castille-La Mancha); AQU Catalunya (Cataluña); AQUID (Balearic Islands); AVAP (Valencia); Univasq (Basque Country).

⁸² The results of other fields were: Experimental Committee (68%); Health (66%); Social Sciences (64%); and Technology (65%).

⁸³ The other fields were: Engineering and Architecture (75%); Science (70%); and Art and Humanities (68%).

selecting researchers or for obtaining promotion affects the foreign researchers and also makes the internal mobility of Spanish researchers more difficult.

In summary, Spain has a dual market for researchers with increasing unemployment rates, high temporariness, and a low level of access to research project funds for researchers with temporary contracts. Currently, the career path for young researchers is nearly non-existent, making human resource management the area that probably requires the most urgent action in the Spanish R&I system (ERAC, 2014).

3.2.3 Access to and portability of grants

Spain follows a rather open strategy regarding cross-border access to research grants for the training of individual researchers, but this access is more restricted when considering calls for R&D projects. Non-national researchers (EU and non-EU nationals) can apply to the human resources programme calls (e.g. “Pre-doc”, “Juan de la Cierva”; “Ramón y Cajal” within the “education and training” and “employability” programmes). These calls usually require researchers to develop their projects in a Spanish research institution. Tenders for R&D projects generally require principal researchers to have a Spanish institutional affiliation for the whole duration of the project, which favours Spanish-based researchers with permanent positions.⁸⁴ Members of the research team are generally also required to have this institutional affiliation. In addition, tenders for R&D projects are accessible to foreign firms operating in Spain.

The portability of grants is more limited. Most of the grants targeting researchers require an agreement between the researcher and the host institution. If the researcher wishes to undertake the research in a different institution, the host institution has to allow it. Committees can, however, mediate if there is a disagreement between the researcher and the host institution. One of the main components of the international scope of the Spanish PN (2008-2011) was the opening up of the programmes to R&D groups from other countries. However, in most of the cases research grants are not portable and a researcher awarded a research grant is not normally allowed to transfer it to a foreign institution or another national one. Institutions are reluctant to facilitate portability, as it implies a loss of resources. The new EESTI plan (2013-2016) follows the previous plan and encourages the internationalisation of the research system. It recognises that the lack of international mobility and the reduced capacity to attract researchers with foreign experience to Spanish research centres are still important challenges for the Spanish research system (PECTI: 8).

Many programmes for human resource development are open to applications from abroad, promote cross-border mobility or require stays abroad (or in another institution) in order for access to them to be obtained. This is the case, for example, with the calls included in

⁸⁴ This information is based on some programmes included in the PECTI, and regional calls apply similar criteria. Some exceptions are made for researchers granted Ramón y Cajal fellowships. In 2014, the call for R&D projects (“Promotion of R&D and innovation towards societal challenges”) included a specific sub-call for young researchers with temporary institutional adscription (“[Proyectos de I+D+I para investigadores sin vinculación o vinculación temporal 2014](#)”). However, excludability criteria have considerably reduced the opportunities for applying to these calls (e.g. excluding members of a research team in a previous R&D project call).

the “Recognition and promotion of talent and employability Programme” (see Table I in section 2.2).

3.2.4 EURAXESS

Spain joined the ERA-MORE Network in 2004, which was rebranded as EURAXESS in 2008, in order to provide better information and support to researchers regarding administrative procedures, funding, job offers and other relevant issues for mobile researchers (e.g. visas and social security). The FECYT coordinates this network at the national level. It has more than 80 centres in different regions, which all have signed the Declaration of Commitment. The network includes over 80 centres organised into regional nodes. The structure of the network includes: 1 coordinate centre (FECYT); 16 Euraxess Service Centres (ESC) per region (Autonomous Community- CA) and all the rest of the centres are Local contact points (universities, research organization, etc.) organised in networks by CAs. FECYT publishes a [guide](#) for foreign researchers coming to Spain and also manages the web [Euraxess Spain](#), which provides information and support for such foreign researchers. In 2012, the Spanish Euraxess network handled 28,848 requests, representing 18.26% of the total requests in the European network. A total of 31.8% of these were about permits and working conditions for non-European citizens, and 17.06% about funding and grants, followed by other questions regarding permits and working conditions, and housing. It is important to mention that most of the requests come from Cataluña (63.11%), followed by Andalusia (15.03%) and Madrid (6.96%). The use of the Spanish network has increased during the last two years (about 20,000 requests in 2010) (FECYT, 2013b). EURAXESS Spain also promotes the Charter and Code and the EURAXESS Jobs portal among Spanish research performing organisations.

3.2.5 Doctoral training

Doctoral training is regulated by [Royal Decree RD 99/2011](#). Universities enjoy high levels of autonomy in the organisation of their doctoral training programmes. Within the general framework set by the national regulations, they can organise doctoral training according to their internal regulations. Currently, universities are still adapting to these “new” regulations, according to the expert University Commission Report “Proposal for the reform of the quality and efficiency of the Spanish University system” (MEDU, 2013a: 75). This report subscribes to all the principles of the Innovation Union regarding the Innovative Doctoral Training.⁸⁵ Spain has 1,751 doctoral programmes: 1,564 in public universities and 187 in private ones (data for 2012). 5.7% of them are inter-university PhD programmes. A total of 24.7% PhD students are foreign. As mentioned earlier, the number of PhDs awarded in Spain is increasing (6,944 in 2007 and 10,531 in 2012), and the unemployment rate has also increased among PhD holders, from 1.7% in 2007 to 4.7% in 2012 (MEDU, 2013b).

⁸⁵ The principles of Innovative Doctoral Training are: research excellence, attractive institutional environment, exposure to industry and other relevant sectors, international networking, transferable skills training, and quality assurance. See section 3.2.2 for the labour market for researchers, as this also includes PhD students.

Recent policy measures are aimed at implementing some elements of the Innovative Doctoral Training. The programme “[Campus of International Excellence](#)” (CIE) promotes research excellence by encouraging university campuses to establish collaboration with other institutions, to specialise and to internationalise. Committees of national and international experts evaluate university strategic plans. The programme was launched in 2008 in the framework of the [University Strategy 2015](#). Since then, twelve national campuses and eight regional university campuses have received this recognition. As required by the programme, the first campuses granted a CIE recognition are being verified after a period of 4 years. The indicators suggested for this verification indicate that all the principles of the Innovative Doctoral Training are being met.⁸⁶ The “[Severo Ochoa](#) and [María de Maeztu](#)” sub-programme is also worth mentioning, as it supports excellent research centres and groups, including training. This sub-programme was launched in 2011 within the framework of the NP (2008-2011). Only a few doctoral programmes exist in collaboration with foreign universities and the introduction of English as a spoken language in PhD courses is still at an early stage. Interdisciplinary research options are recognised by the LCTI and the EESTI, but mainly refer to researchers’ mobility. Education curricula in the past only infrequently included transferable skills training. However, the Bologna Process is helping to include this aspect, at least formally, in universities’ educational plans. The National Agency for Evaluation and Accreditation (ANECA) evaluates and recognises the quality of PhD programmes, granting them a “[Mention of Excellence](#)” when they comply with certain criteria for quality.

The EECTI strategy (2013-2020) aims to promote “Industrial PhD programmes”⁸⁷ (€2.3m estimated in 2014-MINECO) involving universities and firms. This could help to improve the knowledge transfer system and the match between education and training supply and employment needs (EW, 2012; OECD, 2011a and 2011b; ERAC, 2014). In addition, it aims at encouraging intersectoral job mobility. The “Torres Quevedo” sub-programme also aims at promoting researchers’ intersectoral mobility (€15m estimated in 2014-MINECO).

3.2.6 HR strategy for researchers incorporating the Charter and Code

The EESTI strategy (2013-2020) and the LCTI follow principles set out in the Charter and Code. More than 100 research institutions have endorsed the Charter and Code ([Euraxess access](#)). The Spanish government requires all universities that apply for public support from tenders for Human Resources programme to accept and comply with the Charter. Where all universities obtained public support, it could be said that implicitly all universities subscribed to the charter. However, following the EECTI, national calls included in the PECTI usually refer to the Charter & Code. This includes calls for the promotion of human resources on R&D (e.g. “[Programa Estatal de Promoción del Talento y su Empleabilidad del Plan Estatal de Investigación Científica y Técnica y de Innovación 2013-2016](#)”- Additional Disposition n4) and more general calls (e.g. “[Retos de la Sociedad, en el marco del Plan Estatal de Investigación Científica y Técnica y de Innovación 2013-2016](#)” Additional Disposition n4). Twelve institutions have acknowledged the HRS4R ([Euraxess access](#)

⁸⁶ According to the [Evaluation Procedure](#).

⁸⁷ This programme is supposed to be launched in the following weeks of December 2014 (Mineco [press note 5 December 2014](#)).

17.12.2014). National authorities, however, do not appear to apply performance agreements to incentivise the effective implementation of the HRS4R by public funded institutions.

The attractiveness of the academic labour market for domestic and foreign researchers has decreased considerably in recent years and especially after the financial crisis. As referred to earlier, the career path for young researchers is nearly non-existent, with increasing number of young researchers occupying temporary positions and with few opportunities to access a permanent one (Mora, 2001; ERAC, 2014). As mentioned (see section 3.2.2), this is mainly due to the dual labour market for researchers (permanent civil servants and non-permanent), the bottleneck created by the rapid growth in the number of university students and permanent research positions in the previous decades (Mora, 2001), the decrease in public project funding after the financial crisis (see section 2.5), and the lack of implementation of measures to address this situation (ERAC, 2014). The low level of implementation of the “Access Contract” (a type of contract that could replace the civil service type), the lack of additional measures to alleviate the situation (e.g. JAE post-doc, Juan de la Cierva and Ramón y Cajal grants have decreased or been cancelled) and the limitations on temporary researchers’ access to research funds (see section 3.2.3) have made the career path for researchers very difficult. Young researchers are suffering the consequences of the budget cuts and urgent action is required in order to alleviate their situation (ERAC, 2014). This labour market is unattractive to foreign researchers, as there are other additional barriers (e.g. ANECA accreditation is excessively bureaucratic and a burden for foreign researchers) which make their integration into the system very difficult.

3.2.7 Education and training systems

Policies to ensure a sufficient supply of postgraduate in science, technology, engineering and mathematics fall into the general programme of supply of human resources for science and technology. Data about the number of graduates in “Engineering and Architecture” and “Science” have decreased over the last decade (the former field by a -23.3% and the latter by -25.3% from 2002-03 to 2012-13) (MEDU, 2013b). The appropriate mix of skills among the population (including strong vocational and education and system skills) in the medium-to-longer term is difficult to assess, but in more general terms it is recognised that there is a mismatch in skills and the areas of scientific specialisation (ERAC, 2014).⁸⁸

The Bologna process has improved the focus of education and training curricula on equipping people with the capacity to learn and to develop transversal competences such as critical thinking, problem solving, creativity, teamwork and intercultural and communication skills (MECES, 2014). However, this process was implemented with a low degree of consensus among stakeholders and small budget for its enactment (Tarrach et al., 2011; MEDU, 2013a), which might have reduced its effectiveness in incorporating these

⁸⁸ The ERAC report places this mismatch in the different attainment of education and the publications and patents by fields. Spain “displays at the same time a very high share of its population having achieved ...tertiary level education (40% against 34.7% for the EU) and another share of the population having only attained lower secondary education level (25% against 12.5%)” (2014: 17). It also has a mismatch in all the scientific and technological fields except for food and agri-food, and health.

aspects. ANECA evaluates the education and training curricula through the program VERIFICA and by applying the “Spanish Qualifications Framework for Higher Education” (MECES) within the “Framework for Qualifications of the European Higher Education Area (FQ-EHEA) (MECES, 2014). A total of 406,906 students remained on a pre-Bologna programme in 2012-2013 (MECES, 2014).

The most significant measures for promoting excellence in education are the programme “[Campus of International Excellence](#)” (CIE) and the “[Mention of Excellence](#)” awarded by the National Agency for the Evaluation and Accreditation (ANECA) to high quality PhD programmes. In addition, the “[Severo Ochoa Centres of Excellence and the María de Maeztu Units of Excellence](#)” sub-programme should also be mentioned here, as it supports excellent research centres and groups, including training.

COTEC reports (2011, 2012, 2014) appear to indicate an increase in the innovative culture of universities and research centres.⁸⁹ However, improvements in the curricula of universities and the evaluation of innovative activities of researchers appear to be necessary (ERAC, 2014).⁹⁰ The new entrepreneurial Support Act (see section 2.2) might help to increase entrepreneurial activities, although its training aspects are not preeminent.

3.3 ERA priority 5: Optimal circulation and access to scientific knowledge

3.3.1 e-Infrastructures and researchers’ electronic identity

Following strategies for the promotion of open access (see below 3.3.2), new national, regional and institutional initiatives aim at encouraging the development of research and education-related e-infrastructures and digital research services for the dissemination of knowledge. At national level, the new Law (LCTI), the new Strategy (EESTI – 2013-2020) and Plan (PECTI – 2013-2016) are the most important ones. Following the implementation of the LCTI by the PECTI, institutional research and data repositories are becoming increasingly frequent.

Similarly, the measures supporting researchers’ access to digital research services in other organisations (within the country itself and in other countries) by using their own user account are supported by open access data initiatives. At national level, for researchers working at national research organisations the FECYT facilitates access to bibliographic research information (Web of Knowledge and Scopus).

At regional and institutional levels, purchases by a consortium of university libraries are common. The [Spanish Public Universities and Research Libraries Network](#) (REBIUN) provides access to searches of the archives of 74 State Universities and exchanges. This network has been holding regular meetings since 2002 (EC 2011).

⁸⁹ For example, 43.8% of experts interviewed consider that researchers and technicians are increasingly aware of the need to provide more market-oriented research (COTEC, 2014: 137). However, the financial crisis has caused experts’ opinions to evolve negatively concerning the general trends of the Spanish innovation system for firms and public administration (COTEC, 2014: 139).

⁹⁰ For example, policy documents establish a suitable agenda that needs to be accelerated. In addition, there is currently a lack of recognition of these entrepreneurial activities for the career development of researchers.

The [Eduroam ES project](#), coordinated by the [IRIS Network](#), supports a common roaming environment between Spanish research organisations, allowing individual researchers to access network services in other public research organisations.

The LCTI Law (Art. 37) promotes open access by encouraging the development of open access archives of the researchers', including access to other similar initiatives at national and international level. The EESTI (2013-2020) implements this by including an "articulation mechanism" (number 2) to promote open access to data, publications and research results financed by public funds, including guidelines for creating shared archives. At national and regional levels, there are several initiatives for collecting information on researchers (CVs) through the standard "Curriculum Vitae *Normalizado*", which is a format for exchanging research information among systems. It is implemented in 90 Spanish institutions (including 50 universities) and nearly 60,000 researchers have created their CV in the CVN format. Moreover, FECYT is working on the standardisation of CVN with the European standard CERIF (Common European Research Information Format). The Andalusian System of Research Information (SICA) is the curriculum manager for the production of scientific activity, structured according to the CVN standard. It also aims to help researchers to find research partners. Spain has "also created a quality certification service based on international standards, similar to the German DINI Certificate" (EC, 2011c: 27)

No major concerns or new measures appear to have been taken at national level to address challenges such as personal data security, the scope of personal data use, and identity validation and tracking. The LCTI (additional disposition 9) follows the [Law 15/1999](#) on personal data protection, extending it to the treatment and sharing of research data. It indicates that the government will regulate, with the help of the Spanish Data Protection Agency, the academic content of the researchers' CVs which funding and implementing agencies can make public without their consent. In addition, the LCTI (Art. 15) recognises the obligation of researchers to protect data and confidentiality agreements in their work.

3.3.2. Open Access to publications and data

Spain has maintained important initiatives in favour of open access to scientific information. The new law (LCTI), the regulation on official PhD training programmes, the new strategy (EESTI – 2013-2020) and the new plan (PECTI – 2013-2016) could be considered the most important initiatives.

The LCTI includes a disposition (Art. 37) on open access. It states that: public research organisations should promote the development of open access archives of researchers' publications, including access to other similar initiatives at national and international level; researchers should publish a digital version of the results of their publicly funded research no later than 12 months after their publication; these should be uploaded in open access archives; and the Ministry should facilitate central access to those archives and promote links with international archives.

Royal Decree 99/2011, of 28 January, that regulates official PhD training programmes, states that an electronic copy of every doctoral thesis approved in any Spanish university should be deposited into an open access institutional repository.

The EESTI (2013-2020) includes as an “Articulation mechanism” (number 2): the promotion of open access to data, publications and research results financed by public funds, including guidelines for creating shared archives.

PECTI (2013-2016) includes a sub-programme for the development of new technologies (AEESD2.2). This programme includes the promotion of “Open Access” through technological forums and platforms. The plan appears to be less ambitious in its implementation of the strategy and application of the LCTI regarding open access. Public budget cuts could also affect the implementation of measures regarding open access.

The Digital Agenda for Spain is a soft action that was adopted in February 2013. It provides a framework reference and a roadmap for the Digital Agenda strategy for 2013-2015 in order to develop the digital economy and society. One of its main objectives is to increase the efficiency of information technology investments in R&I.

There are also some regional regulations that promote access to open repositories with peer-reviewed scientific articles. For example, in the Autonomous Region of Asturias and the Autonomous Region of Madrid, the former requires to be deposited in its institutional repository with an embargo period of no more than six months. The latter considers papers, working papers and data and a field dependent embargo period of no longer than 6 months (EC, 2011b).

In Spain there is an important set of infrastructures that allow researchers to archive their work in open access: institutional repositories, thematic repositories, research open journals and research open journals portals. Among these, institutional repositories play a central role for the proper implementation of the National OA public policy.

RECOLECTA is a national joint programme of the Spanish Public Universities and Research Libraries Network (REBIUN) and the FECYT to create an e-infrastructure for repositories in Spain and its integration with international repositories. RECOLECTA is an open platform that gathers all the national scientific repositories together in one place and guarantees that all OA repositories are interoperable among them. It plays a key role to allow a proper implementation of the national open access to science policy. It promotes and coordinates the national infrastructure of Open Access digital scientific repositories in an interoperable manner based on the standards adopted by the global community. There are 66 institutional repositories in RECOLECTA and 39 Spanish research institutions have signed the Berlin Declaration (Berlin9; accessed 19.12.2014).

There are an increasing number of public universities with institutional policies in favour of open access. Open institutional repositories are becoming frequent in Public Universities, especially open access to PhD dissertations. Some of them include “Creative Commons” licences. Some universities, like the University of Alicante, give direct financial help to departments or research groups according to the number of documents they deposit in the institutional repository (Open Aire; EC, 2011b). The Alhambra Declaration was signed in May 2010 by a group of open access stakeholders (editors, librarians, funding agencies, university rectors and authors) from the countries in southern Europe (Spain, Portugal, France, Italy, Greece and Turkey), whose main languages are different from English, to promote open access to scientific productions. OpenDOAR, a website directory of academic open access repositories, indicates that Spain has 115 open-access repositories (accessed 19.12.2014).

Calls for research proposals launched in 2013 and 2014 in the framework of PECTI are implementing Art. 37 of the LCTI which makes it compulsory for researchers to either publish in open-access journals or to self-archive the publication in institutional or field related open-access repositories. It also makes it compulsory for researchers to make their micro-data collected with public funds available within a period of 12 months after finishing the project. These micro-data have to be transferred to databases, such as the Data Bank for Social Sciences in the Centre for Sociological Research (CIS). The open access to these data depends on the condition imposed by these hosting institutions and the type of data. These open access conditions are, for example, imposed in the “R&D call for societal challenges for research” (*Retos Investigación: Proyectos I+D+i*) (Art. 6 – publications and Art. 8 – data).⁹¹

Data on open access collected by RECOLECTA (access 27.03.2015) for Spain indicate that Spain shares more than 930,000 publications in open access. With a sample of 5,461 papers, the distribution of Spanish articles across types of open access from 2008-2011 is as follows: 2,074 (38%) Green & Hybrid; 604 (11%) Gold; and 2,678 (49%) Open Access (EC, 2013f). It appears that Spanish researchers tend to publish more often than the EU-28 average researcher in Gold or Open access format.

In summary, measures for Open Access (OA) to scientific research and publications are being taken. The predominant OA type appears to be the Green one. Funding for national programmes includes specific conditions making it compulsory for the researcher to grant OA to their publications and to deposit the micro-data collected. The cost of publications in OA journals could be considered research costs and are specifically mentioned in the calls. Open access repositories are becoming more frequent (see RECOLECTA above). However, it appears that they include mainly publications and, less frequently, data.

⁹¹ They also follow the recommendation of the European Commission of 17 July 2012 regarding access to and preservation of scientific information.

4. Innovation Union

4.1 Framework conditions

The innovation performance of Spain is lower than the European average, particularly regarding business-related indicators as firms' investments in R&I, entrepreneurship and linkages, and innovators⁹² (EC, 2014b). Several measures have been tried, in order to improve the framework conditions for supporting business investment in research and innovation. The role of innovation, private R&I and knowledge transfer has increase in the Spanish policy mix in recent years. This change can be seen through the changes in the objectives of the strategies and plans (see section 2.2.), new initiatives, instruments and budget allocation (see section 2.5.3). Specific programmes have been launched to promote innovation clusters, knowledge transfer platforms and other instruments to support private-public cooperation that aims to improve the environment for innovation (see section 4.4). In addition, a diverse set of indirect mechanisms (e.g. tax incentives) is also meant to increase private R&I activities (see section 2.5.3). There is some indication that some of these efforts have improved the innovation culture of the country, especially among universities and research centre (COTEC, 2011a, 2014) (see section 3.2.6).

Similarly, some of these measures aim also to improve the synergies between supply and demand-side policies and instruments. For example, the advisory council CACTI, which gathers representatives from the research community, enterprises and trade unions, should help to improve joint formulation. However, joint formulation, coordinated implementation and systemic evaluation of supply and demand-side policies is challenged by the structure of the Spanish governance system (ERAC, 2014) and might require additional efforts to maximise their articulation and synergies (see section 2.7). For example, the implementation of research and innovation policies by different Ministries might require extra efforts to guarantee synergies between these two areas.

4.2 Science-based entrepreneurship

Spain has recently designed a large number of support schemes to foster R&D cooperation and knowledge transfer (see section 4.4 for more details). These programmes aim to improve a level of public-private collaboration that has been considered low (OECD, 2006; COTEC, 2012). The National Programme (Np) on public-private cooperation was designed to increase this cooperation, and was included in the Instrumental Working Line (IWL) "Articulation and internationalisation of the system" of the Spanish National Plan for R&I (NP) (2008-2011). Public-private cooperation has been included in the new policy framework (PECTI 2013-2016) in the "Business leadership programme" (which represents 19.4% of the provisional budget for 2014).

Some relevant sub-programmes for knowledge transfer are: [INNOCORPORA](#) (including the Torres Quevedo programme) (€72.7m in 2011 and €25.6m in 2012); [INNPLANTA](#)

⁹² Firms' investments in R&I includes R&D and non-R&D business expenditure. Entrepreneurship and linkages include SMEs innovating in-house; Innovative SMEs collaborating with others; and public-private co-publication. The term 'innovators' includes SMEs introducing product or process innovations; SMEs introducing marketing or organizational innovation; and fast-growing firms in innovative industries.

(Technology parks) (about €206.7m in 2011 and €12.5k in 2012), current plan [EQUIPA](#) (foreseen budget for 2013 €70m and €40m for 2014); [INNOCIDE](#) (Knowledge Transfer Offices) (€6.3m in 2011); [NEOTEC](#) (New Technology Based firms) (€32.3m in 2011 and €8.1 in 2012) (foreseen budget for 2013 €5m and €6.5m for 2014); [Innovative Companies Associations and Clusters](#) (AEI) Programme (€7.5m in 2011); [INNFLUYE](#) (Technology platforms) (€6.1m in 2011) (foreseen budget for 2013 €1.5m) (FECYT, 2012; MINECO, 2013, 2014) (see section 4.4 for more details).

The LCTI (2011) has introduced several changes to improve the mechanisms of knowledge transfer: (1) increasing the value of transfer activities (e.g. by detecting research groups whose knowledge could be applied or by increasing the role of OTRIs) (2) promoting “units of excellence” (Art. 33.1) or (3) developing an open-access archive with research results. It encourages the creation of Technological Based Enterprises by allowing researchers to work part-time in private firms created by the organisations in which they are working, and by eliminating restrictions on the maximum share ownership of a private company (10%) and the restrictions on being a board member in private companies (see section 4.4 for more details).

Data detailed on risk capital by stage of development indicate that 6.3% go to start-up. The investments in risk capital including seed capital, start-up funds and funding for other stages of the business creation in 2012 was €1,470.2m and represents 0.009% of the Spanish GDP. This has decreased significantly since 2010 (€2,479.7m) by 20.4% in 2011 and by 25.5% in 2012 (ICONO-Eurostat, 2014). In 2013, this data decreased significantly by 49.1%, reaching a figure of €750.5m (Eurostat - 2014).

4.3 Knowledge markets

The new LCTI Law (2011) has changed the regulation of the ownership of Intellectual Property Right (IPRs) produced by the staff of university and public research bodies. It modifies the previous Law of Sustainable Economy (Law 2/2011) to allow researchers to profit from their patent earnings. It is difficult to judge whether the system is efficient, affordable and effective, as support might change across research institutions and regions.

The Entrepreneurship and Internationalisation Support Act (Law 14/2013) published on 27th September 2013 aims at improving the training for entrepreneurs by encouraging creativity at different educational levels (Chapter 1; Articles 4, 5 and 6).

The new EESTI Strategy (2013-2016) includes as an articulation mechanism (number 5) the harmonisation of criteria and practices of ex-ante and ex-post evaluations and aims to improve collaboration between the administration and the private sector to eliminate regulatory barriers. However, it does not specify a screening process of new or existing regulations regarding their impact on innovation.

The National Reform Programme 2013 aims at improving the protection of intellectual property rights through a reform of the Codified Text on the Law on Intellectual Property. One of its aims is to increase transparency in the entities that manage IPRs, by promoting competition and allowing new operators to enter this market and to transpose some EU directives to the Spanish legal system (Directive 2011/77/EU, amending Directive 2006/116/EC on the term of protection of copyright and certain related rights).

Due to objections to the requirement that translations should be only in English, German and French, Spain has neither signed nor ratified the European Agreement on the Unified Patent Court, and no publicly available specific policy measures appear to be applied to support the use of the Guidelines on Horizontal Cooperation Agreements regarding standard-settings. However, legislation appears to be applied as judged by the court ruling on decisions based on the agreement. The “Technology Platforms” (before INNFLUYE) programme might be considered as an instrument to develop knowledge markets for patents and licencing.

4.4 Knowledge transfer and open innovation

The role of innovation and knowledge transfer has been gaining importance in the Spanish Policy mix over the last few years. The new EESTI strategy (2013-2020) and PECTI plan (2013-2016) follow previous efforts in this direction (e.g. INGENIO 2010, National Plan for R&D (2008-2011) and e2i). They encourage the creation of NTBFs and university spin-offs; the promotion of R&D projects in general and more specifically public-private cooperation in long term strategic projects (e.g. Sub-programme of collaborative R&I – INNPRONTA in the previous plan); policies to foster human capital, such as the incorporation of PhD holders into the private sector; offering extra financial support for R&I in general and specifically for risk capital, paying attention to societal challenges and public procurement for the acquisition of innovative goods and services. The new Entrepreneurship and Internationalisation Support Act (Law 14/2013) also aims at improving finance for entrepreneurs and reducing the administrative burden on starting a new business (see 2.2).

As mentioned, the investments in risk capital including seed capital, start-up funds and funding for other stages of the business creation was €1,470.2m in 2012 and represented 0.009% of the Spanish GDP. This has decreased significantly since 2010 (€2,479.7m): by 20.4% in 2011 and by 25.5% in 2012 (ICONO-Eurostat, 2014). In 2013, these data decreased significantly by 49.1%, reaching a figure of €750.5m (Eurostat - 2014). In Spain, there were about 54 networks and groups of Business Angels in 2009 (OECD, STI Scoreboard 2011, from FECYT). Public funds for innovation and knowledge transference are mainly included in the “Business leadership programme”, which includes three sub-programmes: (1) Private R&I; (2) Enabling technologies; and (3) Collaborative R&I. In 2013, it was estimated that this programme would distribute €831.9m (approximately 21.5% of total funds), distributing €81.4m, €10.8m and €333.5m through the sub-programmes mentioned above (MINECO, 2013). In 2014, this programme was expected to decrease by 28.4%. The distribution of budget changed, with the “private R&I” sub-programme receiving the greater part of the programme budget (€345.1m of €596m see Table II) (MINECO, 2014)⁹³

Spain has recently designed a large number of support schemes to foster R&D cooperation and knowledge transfer. These programmes aim to improve a level of public-private collaboration that has been considered low (OECD, 2006; COTEC, 2012). The National

⁹³ In the previous National Plan (2008-2011, extended to 2012): public-private cooperation, human resources, boosting and value added. In 2011, knowledge transfer activities funded total €856.74m, less than in 2010 (€935.28m in 2010), distributing across the different objectives the following total funds: €555.7m; €72.68m; €222.17m and €8.18m (FECYT, 2012).

Programme (NP) on public-private cooperation was designed to increase this cooperation. This programme is included in the Instrumental Working Line (IWL) “Articulation and internationalisation of the system” of the Spanish National Plan for R&I (NP) (2008-2011). In 2011, the NP on “Public-Private Cooperation” had two instruments: INNPACTO and INNPRONTA (FECYT, 2012). In 2012, the NP on “Public-Private Cooperation” had three instruments: INNPACTO, FEDER-INNTERCONECTA Andalucía and FEDER-INNTERCONECTA INNPRONTA Galicia (FECYT, 2014). This programme distributed €493.3m in 2012 and the three above-mentioned instruments represented 74.4%, 19.6% and 6.1% respectively of the total programme. Compared to 2011, the budget for “Public-Private Cooperation” decreased by 24.6% in 2012. Public-private cooperation has been included in the new policy framework (PECTI 2013-2016) in the “Business leadership programme” (which represents 21.5% of the provisional budget for 2013), “sub-programme of collaborative R&I”, which represents 40.1% of the programme budget (€333.5m) and, in particular, through the “Strategic public-private collaboration projects for business development” instrument, which represents 60% of the sub-programme.

Some relevant sub-programmes in for promoting knowledge transfer are: [INNCORPORA](#) (including Torres Quevedo programme) (€72.7m in 2011 and €25.6m in 2012); [INNPLANTA](#) (Technology parks) (about €206.7m in 2011 and €12.5k in 2012), current plan [EQUIPA](#) (foreseen budget for 2013 €70m and €40m for 2014); [INNCIDE](#) (Knowledge Transfer Offices) (€6.3m in 2011); [NEOTEC](#) (New Technology Based firms) (€32.3m in 2011 and €8.1 in 2012) (foreseen budget for 2013 €5m and €6.5m for 2014); [Innovative Companies Associations and Clusters](#) (AEI) Programme (€7.5m in 2011); [INNFLUYE](#) (Technology platforms) (€6.1m in 2011) (foreseen budget for 2013 €1.5m and €5.5m for 2014). Two above-mentioned national sub-programmes provided specific state aid support for promoting clusters of innovation: Innovative Companies Associations and Clusters (AEI) and the sub-programme of technology platforms INNFLUYE. These programmes distributed €7,536k and €6,050k respectively in 2011 (FECYT, 2012).

The LCTI (2011) has introduced several changes to improve the mechanisms of knowledge transfer: (1) increasing the value of transfer activities (e.g. by detecting research groups whose knowledge could be applied or by increasing the role of OTRIs); (2) promoting the “units of excellence” (Art. 33.1); or (3) developing an open-access archive with research results. It encourages the creation of EBTs by allowing researchers to work part-time in private firms created by the organisations in which they are working and by eliminating restrictions on the maximum share ownership of a private company (10%) and the restrictions on being a board member in private companies. However, academics engaged in cooperation with industry are not usually rewarded. Neither access to an academic career nor promotion mechanisms recognise these activities, which are based mainly on traditional research outputs. Open innovation is mentioned in the EECTI (2013-2020) within the priority axis (5.3) – knowledge transfer and management. It states that “open innovation involves different internal and external agents, includes new management of property rights, knowledge value and all intangibles of the knowledge process (p. 34)”. It considers that in order to achieve this, measures should be directed towards: (a) detecting innovative research and technology; (b) developing tools for business intelligence and dissemination of results; (c) defining a way to protect knowledge and results from research to facilitate knowledge sharing and usage; (d) establishing efficient mechanisms for technology transfer and commercialisation; (e) promoting public-private partnerships and research mobility between sectors; and (f) and including professionals of R&D

management in the public and private system. Some of the measures mentioned above are directed towards this interesting agenda set by the strategy.

4.5 Innovation framework for SMEs

Spain stands 74th in the ranking of 189 countries in relation to the ease of starting a new business and 23rd concerning the ease of resolving insolvency (WB, 2014). Through the Entrepreneurship and Internationalisation Support Act (Law 14/2013), Spain has improved its legal framework for doing business and becoming an entrepreneur. Among the changes (see section 2.2), the new legislation has limited the responsibility for entrepreneurs and included provisions for granting new opportunities to the ones that have failed in their entrepreneurial venture. The law has implemented a legal status of “Limited Liability Entrepreneur” (*Emprendedor de Responsabilidad Limitada*) and “Progressively Formed Limited Liability Company” (*Sociedad Limitada de Formación Sucesiva*); has reduced the time for creating a limited liability company; and created an extra-judicial payment mechanism in order to grant entrepreneurs a second chance. These changes appear to have improved the ease of starting a new business in the country, and consequently improved Spain’s ranking from 115 last year to the current one of 74 (WB, 2015). Spain has also significantly reduced the number of procedures and days necessary for starting a new business, from 10 to 6 and from 23 to 13 respectively, over the last two years (WB, 2014). However, the country’s score on the strength of the insolvency framework has not changed over the same period: Spain stills scores 12 in a range of 0-16.

The innovation performance of Spain is lower than the European average regarding business-related indicators as firms’ investments in R&I, entrepreneurship and linkages and innovators (EC, 2014b). Several programmes have been launched to promote innovation clusters, knowledge transfer platforms and other instruments to support private-public cooperation that aim to facilitate knowledge transfer, including SMEs (see section 4.4). Regarding the use of innovation vouchers, some regions have implemented this system, but there is not such an initiative at national level (ERAC, 2014: 47).

The diversity of instruments and support schemes for innovation in Spain appears to be difficult to capture and to exploit for SMEs (ERAC, 2014: 47). In addition, many instruments are transformed, suppressed or renamed, which makes it more difficult for SMEs to access innovation support schemes. The existence of measures targeting SMEs at national and regional level also makes it more difficult for SMEs to have a full knowledge of the innovation opportunities to which they could gain access. Beneficiaries of public support from national schemes usually require easier application procedures: the long waiting time for reimbursement and the complicated application and evaluation process are frequent causes for complaint by beneficiaries (EW, 2011, ERAC, 2014). Similarly, benefits from tax incentives appear to be excessively bureaucratic and more difficult to use for SMEs. Despite being one of the most generous schemes (OECD, 2006), therefore, they are not frequently used (EW, 2011; ERAC, 2014).

The PECTI national plan (2013-2016) gives special attention to business R&I and SMEs by including them in its fifth objective. This aims at “boosting business leadership in R&I by enabling a firm’s R&I capacities and increasing the role of SMEs in the innovation process” (PECTI: 9). This objective also considers increasing the internationalisation of indigenous firms. In 2013, Spain was involved in 40 new Eureka projects (including clusters) (€64.5m),

25 Eurostars (€16.9m) and 31 Iberoeka (€14.5m). CDTI certified 11 new cooperation projects in the bilateral framework with China, South Korea and India (€9m) (CDTI, 2013). However, it is difficult to establish the degree of involvement of SMEs in these programmes, as only the Eurostars programme is focused on technologically oriented SMEs. The “Global Innovation CDTI” is a new instrument targeting SMEs with technological capacity and financial potential. It has a provisional Budget of €50m for 2014 (MINECO, 2014) and joins other schemes, such as NEOTEC or ENISA initiatives for firms. The Spanish policy innovation framework has been considered too focused on technological innovation (ERAC, 2014), which might be considered a disadvantage for SMEs, as these usually have less technological capabilities.

4.6 Venture capital markets

The investments in risk capital including seed capital, start-up funds and funding for other stages of the business creation was €1,470.2m in 2012 and represented 0.009% of the Spanish GDP (see Table 1). This has decrease significantly since 2010 (€2,479.7m) by 20.4% in 2011 and by 25.5% in 2012 (ICONO-Eurostat, 2014). In 2013, this data decreased significantly by 49.1%, reaching a figure of €750.5m (Eurostat - 2014). In Spain there were about 54 networks and groups of Business Angels in 2009 (OECD, STI Scoreboard 2011, from FECYT).⁹⁴ Data detailed by stages of development indicate that most of this funding goes to buyouts (86%), 7.1% to later-stage venture capital, 6.3% to the start-up stage and 0.6% to seed stage capital (EVCA-OECD-2014). These figures might indicate that investments in early stages in Spain is to a certain extent limited. Diverse programmes exist that cover the entire value creation chain (see section 2.5), but it appears that funds for young innovative firms are limited, dispersed and technologically oriented. For example, the NEOTEC initiative funded 22 projects, which are few for a country of the size of Spain (ERAC, 2014) and it focuses on “Technology Based Companies”.

EVCA (2013) reports that the Spanish fund structure and investment vehicles are characterised by: a structure led by “*Sociedad de Capital Riesgo (SCR)*” and “*Fondo de Capital Riesgo (FCR)*”; with no domestic and non-domestic transparency; no permanent establishment tax; undue restrictions; no VAT on management fees; 0.30% of capital gains tax⁹⁵; 0% withholding tax; a requirement for Stamp duties, but not transaction taxes; anti-abuse rules; a 30% company tax rate; a special tax regime for SMEs; limited related-party loans interest deduction; limited unrelated-party loans interest deduction; a 24.35% min and a 51.9% max. income tax; social security between a min of 391.68 and a max of 1,276.07⁹⁶; capital gains tax that ranges from 21% to 27%; and a tax on stock options from 24.35% and 51.9%, with special tax regimes (EVCA, 2013).

⁹⁴ According to the EBAN (2014) report, Spain is the second country in the European angel market with €57.6m of investments (after the UK). It has decreased by 8%, has created 1,485 jobs and made an average investment per company of 235,102 euros.

⁹⁵ Spanish law establishes a 99% tax exemption for capital gains. The remaining 1% is taxed at the company tax rate of 30%.

⁹⁶ These figures are an approximation of the total contribution to social security to be paid by the employer in the event of (i) an employee in the category of engineer and university graduate, (ii) economic activity of office work and (iii) no extraordinary hours being worked by the employee. The employee’s contribution is deducted from their gross salary.

According to the same report, Spain has fiscal incentives for investors, fund managers, business R&D expenditure⁹⁷; R&D capital expenditure, contracting researchers, technology transfer, and cooperative external research, but not for innovative spin-out and young and innovative companies (EVCA, 2013). The Entrepreneurship and Internationalisation Support Act (Law 14/2013) has improved some of these conditions by improving the tax incentives for investments in entrepreneurs (see section 2.2).

In 2014 Spain developed a new “[law proposal for the financing of firms](#)” that includes legislation for investment crowdfunding platforms (lending and equity crowdfunding). This proposal was initially elaborated without the input of the main stakeholders and was seriously criticised by the crowdfunding sector for creating new legal barriers to the small sector instead of creating a legal framework that would allow its growth.⁹⁸ The latest proposal limits the amount allowed per private investor per project (€3,000 for incomes lower than €50,000 per year) and platforms (€10,000 per year), as well as the quantity that a firm can raise through this mechanism (€2m). It also sets important limitations to this type of platform (e.g. setting an initial capital of €60,000, annual administrative costs of more than €3,000). This legislation considerably restricts the crowdfunding market for platforms and investors. In addition, the MINECO through the FECYT has launched a new crowdfunding platform for R&I projects ([Precipita](#)) following the failure of [Tararcea for funding R&D dissemination projects](#). This might crowd out the crowdfunding market for research, affecting the other already existing crowdfunding platforms for science (e.g. Vorticex, F4R, ILoveScience).

4.7 Innovative public procurement

Innovative public procurement has been encouraged in Spain through the establishment of a legal framework, two dedicated policy initiatives, setting a 3% target, and through the creation of a guide to facilitate public procurement activities. However, it is difficult to assess the extent to which these policy instruments have been used and the progress towards meeting the 3% target.

The Law on Sustainable Economy (2011) introduced the public procurement of innovative goods and services as a policy instrument to promote innovation, especially in some specific fields such as environmental protection and digitalisation of public services (For details, see the Mini Country Report of Spain 2011).⁹⁹

The LCTI (2011) reinforced the objectives of these policy initiatives and instruments. INNODEMANDA and INNOCOMPRA were instruments designed to implement these policy goals in the previous National Plan (NP (2008-2011). The current PECTI plan (2013-2016) includes public procurement of innovative goods and services within the Strategic Action of the Economy and the Digital Society, the Programme of business leadership (AEESD 3), and the Sub-programme of business R&I (3.1).

⁹⁷ See Footnote 53.

⁹⁸ *El Confidencial* [[03.10.2014](#)] and [[28.02.2014](#)].

⁹⁹ The legal framework of Innovative Public Procurement include: Law 30/2007 of public procurement; Law 2/2011 Sustainable Economy (Art. 37.1, Art. 38); Council of Ministers – E2i (2/07/10); Council of Ministries-CPI (8/10/10); Law LCTI (2011) (Art. 7, Art 44.3) and the Council of Ministries (8/07/2011) (MINECO-Innovative Public Procurement Guide).

The Council of Ministers ([8/07/2011](#)) agreed on setting a 3% target of new investments by the general public administration to be devoted to innovative public procurement and a guide to disseminate the procedures. The [Innovative Public Procurement Guide](#) was endorsed by the MINECO on 28th October 2011. It includes two modes of innovative public procurement: Innovative Technological Public Procurement and Pre-commercial Public Procurement. Seven tenders have been awarded through the CDTI and one was still open until 7 Nov 2014, but it is not clear whether the 3% objective has been met. More detailed information on national pre-commercial procurement schemes by field, including budgets and modalities, appears not to be publicly available.

According to the MINECO, ten administrative units have endorsed the “[Innovative public procurement protocol](#)”. However it is not clear whether this protocol is required or whether it has been promoted. The programme [COINCIDENTE](#) of the Ministry of Defence is aimed at applying civil developed technologies into military applications ([BOE 17.10.2014](#)) and is considered to be Innovative Technological Public Procurement.

The European Public Sector Innovation Scoreboard (EPIS) 2013 (EC, 2013b) shows that Spain is above the EU-27 average in most of the indicators (13 out of 22). Although the government effectiveness in Spain has decreased from 1.82 in 2000 to 0.98 in 2010, it shows one of the highest improvements in the e-government development index (Egdi), in providing public services through the use of ICT in the period of 2003-2012. The share of in-house service innovators is high (89%) and the perception of the importance of innovation for winning procurement tenders from public administration organisations is that it is greater than the importance of low cost (EC, 2013b).

5. Performance of the National Research and Innovation System

5.1 Performance of the National Research and Innovation system

Spain is a “moderate innovator” with global levels of innovation performance below that of the EU average (EC, 2012a; EC, 2013a and EC, 2014a b). However, in some particular areas it is above the EU average. These lie in tertiary education, international scientific co-publications and medium and high tech exports, while its weaknesses are found in firms’ activities and other economic outputs effects (Table 2). Above the EU-28 average (shown in brackets for the data indicated below) and with generally increasing levels between 2009 and 2012, Spain is outstanding in the performance by its percentage of population aged 30-34 who have completed tertiary education, which changed from 39.4% to 40.1% (35.8%); in the level of international co-publications per million, which changed from 499 to 631 (343); and in its contribution of medium and high-tech product exports to trade balance, which rose from 1.92 to 3.31 (1.27). The investment in venture capital as a percentage of GDP is also above the EU average (0.08), but showed a decreasing trend from 0.11 to 0.09% in the same period. In contrast, Spain tends to underperform in the rest of the S&T indicators, with levels below that of the EU average.

Within these weak areas, however, there are some positive trends. The number of doctorate graduates (ISCED 6) per 1000 population aged 25-34 increased from 1 in 2009 to 1.2 in 2011, despite being below the EU average (1.7). The scientific publications among the top 10% most cited publications worldwide as a percentage of total scientific publications in the country increased from 7.4% in 2002 to 10.4% in 2010, only 0.6 perceptual points below that of the EU average (11.0). The number of public-private co-publications per million of the population increased from 23.89 in 2009 to 28.66 in 2011 (52.84). Patent applications per billion GDP (in PPS€) rose from 1.59 in 2009 to 1.64 in 2010 (3.92). Finally, licence and patent revenues from abroad as a percentage of GDP also increased from 0.05 in 2009 to 0.1 in 2012 (0.59).

The remaining indicators show figures below those of the EU average and decreasing trends. They could be considered the weakest areas of the Spanish R&I system. R&D expenditures in the public sector as a percentage of GDP dropped from 0.67% in 2009 to 0.61% in 2012 (0.75%). In the same period, R&D expenditure in the business sector as a percentage of GDP went from 0.72% to 0.68%, reaching a figure far lower than that of the EU average (1.31%). Patent applications in societal challenges per billion GDP (in PPS€) declined from 0.49 to 0.46, reaching a figure nearly half of that of the EU average (0.85). Similarly, the percentage of knowledge-intensive service exports out of total service exports went from 22.5% to 21.6%, just over half of the EU average of 45.3%.

In summary, the Spanish R&I system has a strong human resource base with positive levels of openness and excellence in the research system and shows some encouraging economic outputs effects. However, the system shows important weaknesses in most of the business-related indicators. Private R&D funding shows levels far beyond that of the EU average and a worrying decreasing trend. Similarly, intellectual assets and economic effects related to knowledge intensive services figures are far below the European average.

Overall, the below EU average figures and decreasing trend of public R&D expenditure is problematic. As the indicators show, the Spanish R&I system displays an excellent and increasing research performance. Spanish researchers are publishing with other international peers much more frequently than their European peers. They are also increasing the quality of their publications and the levels of co-publications with the private sector. This indicates that the efforts made in the research input side in the previous period, with increasing public funding between 2002-2008 (see section 2.5), had a positive effect on the research output side and on the linkages with the private sector. These positive trends in the research output appears to be threatened by the negative trend in research input, namely, R&D public funding. In addition, the system lacks reasonable alternative sources of funding. Research input from the private sector is nearly half of that of the European average and is also decreasing. This trend also makes it difficult to improve the levels of other more innovation-related research outputs like patents, with EPO and PCT patent application figures that are far below those of the EU average.

On average in 2012, Spain produced 15.71 publications per 10,000 inhabitants, above the EU-28 average (13.8). A 42.03% of publications are internationally co-published. In 2012, Spain had about 660 international scientific co-publications per million population, below France that has about 768 of these publications. In the period 2002-2012, 10.82% of the Spanish scientific publications were in the top 10% most cited publications worldwide very similar to the 11% of top scientific publications produced in the EU28 (Science Metrix, 2014).¹⁰⁰ The share of public-private co-publications in Spain is 1.3% in the period 2008-2013 against 2.8% for the EU28.¹⁰¹

¹⁰⁰ These publication data are based on Elsevier's Scopus database. ScienceMetrix, Analysis and Regular Update of Bibliometric Indicators, study conducted for DG RTD. They represent an update of the data displayed in the table below. See also http://ec.europa.eu/research/innovation-union/index_en.cfm?pg=other-studies.

¹⁰¹ Scival 2014, Scopus based publication indicators derived from Elsevier's SciVal platform, www.scival.com last accessed December 2014.

Table 6. Assessment of the Performance of National Research Innovation System

1. ENABLERS	Year	ES	EU
Human resources			
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	2011	1.20	1.70
Percentage population aged 30-34 having completed tertiary education	2012	40.10	35.80
Open, excellent and attractive research systems			
International scientific co-publications per million population	2012	631.21	343.15
Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	2009	10.44	10.95
Finance and support			
R&D expenditure in the public sector as % of GDP	2012	0.61	0.75
Venture capital (early stage, expansion and replacement) as % of GDP	2012	0.04	0.08
2. FIRM ACTIVITIES			
R&D expenditure in the business sector as % of GDP	2012	0.68	1.31
Linkages and entrepreneurship			
Public-private co-publications per million population	2011	28.66	52.84
Intellectual assets			
PCT patent applications per billion GDP (in PPSE)	2010	1.64	3.92
PCT patent applications in societal challenges per billion GDP (in PPSE) (climate change mitigation; health)	2010	0.46	0.85
3. OUTPUTS			
Economic effects			
Contribution of medium and high-tech product exports to trade balance	2012	3.31	1.27
Knowledge-intensive services exports as % total service exports	2011	21.65	45.26
License and patent revenues from abroad as % of GDP	2012	0.10	0.59

Source: European Commission, IUS Database (2014).

While statistics on applications to national patent office are not always comparable across countries, they can provide some indication of technological development activities that are not captured by EPO/PCT data. In Spain, approximately 11,000 patent applications were made at the EPO in the period 2000-2010, while approximately 13,000 patent applicants took the PCT route, and the National Patent Office received over 32,000 applications in this period (these three figures are based on fractional counting).¹⁰²

In order to make a broad assessment of the performance of the national R&I system, it is worth considering other aspects of the R&I policy framework. Following the point of the [IU self-assessment tool](#):

(1) Firstly, the promotion of research and innovation is formally considered in Spain as a key policy instrument to enhance competitiveness and job creation, address societal challenges and improve quality of life (see the EESTI strategy or the NRP), but this formal policy discourse is set back by the severe public budget cuts and by the lowering of the target of R&D per GDP (see section 2.5).

(2) Secondly, the design and implementation of research and innovation policy are based on a multiannual strategy with policy measures increasingly targeting and exploiting

¹⁰² Unpublished data from the "INCENTIM KU Leuven, Universita Commerciale Luigi Bocconi, KITEs and Technopolis Consulting Group, 2014, Measurement and analysis of knowledge and R&D exploitation flows, assessed by patent and licensing data." Study performed for DG Research and Innovation, 2009-2015.

current or emerging national/regional strengths within an EU context. For example, this is done through the implementation of the RIS3 strategies (see section 2.6). However, this design and implementation policy framework is challenged by the lack of coordination between national and regional R&I policies and the small role of the evaluation tools (see section 2.7).

(3) Innovation policies are increasingly pursued and in a broader sense, but innovation is still conceived as mainly technologically driven (see section 4.5). Innovation culture is low, but positively increasing among research actors (see section 3.2). Supply and demand side policies could be developed in a much more consistent manner (see section 3.2 and 4.1).

(4) There is not an adequate and predictable framework for public investment in research and innovation (see section 2.2). Private investment is increasingly encouraged (see section 2.5 and 4.1), but the limited role of strategic management and evaluation policy systems appears to limit the efficiency and effectiveness of these instruments and their synergies with other policy initiatives. For example, innovative financing solutions are implemented (e.g. public-private partnerships), as well as tax incentives, but their use is not sufficiently evaluated (see section 2.5.3).

(5) Excellence is formally a criterion for research and education policy, but is not sufficiently considered when allocating funding to researchers and research institutions or ensuring the career development of researchers (see section 2.5.2 and 3.2.2).

(6) The mix between education and training skills provided by the system could be improved. For example, the increasing unemployment among PhD holders and the decreasing labour market for young researchers shows significant imbalances between supply and demand (see section 3.2). Education and training is increasingly aimed at developing transversal competences (see section 3.2.6).

(7) Partnerships between higher education institutes, research centres and businesses, at regional, national and international levels are increasingly promoted, but mobility levels between the public and private sector are low (see section 4.4).

(8) Framework conditions for the promotion of business investment in R&D, entrepreneurship and innovation are facilitating a move towards a better connection, but the role of non-technological innovation and the involvement of SMEs in the R&I system needs to be improved (see section 4.5 and 4.6).

(9) Public support for research and innovation in business is not simple, not easy to access and not of a high quality. The support schemes are high in number, not clearly differentiated and difficult to access. Funding support is not tailored to the needs of SMEs. The emphasis is placed on the inputs and controls rather than on the outputs, the amount of bureaucracy is high and payments delayed, and funding schemes are not regularly evaluated (see section 4.5).

(10) The public sector itself cannot be considered a driver of innovation, despite the increasing role of public procurement and the encouragement towards open data (see section 4.7 and 3.3). Public funding in R&I has been regarded not as a counter-cycle mechanism to overcome the financial crisis, but as a mere expenditure (see section 2.5).

5.2 Structural challenges of the national R&I system

The critical impact of the financial crisis on the Spanish R&I system has revealed significant lessons on its challenges and opportunities. Spain has been hit hard by the crisis, to the point where a generally positive pre-crisis trend in R&I inputs and outputs has been reversed, becoming an overall negative one in a post-crisis period.¹⁰³

This huge impact of the crisis has shown that one of the main challenges of the Spanish R&I system is its fragile and unstable governance structure. Budget cuts have particularly affected public R&I funding (see section 2.5), indicating that governments, contrary to their formal discourse in support for science, have not seen R&I funding as an investment and a mechanism to overcome the financial crisis, but mainly as an expenditure. Between 2009 and 2013 GBAORD decreased by 39%, reaching a total figure of €5,310m and returning budget levels to figures close to the ones of 2005-2006. Available budget data for 2014 and 2015 on the central government's budget for public expenditure (PGE) to R&I, indicate that the decreasing trend has been halted, but budget levels will remain at the 2005-2006 levels for the next year (ICONO-MINECO: 2014). In addition, and partly due to the budgetary restrictions, the implementation of the R&I plans have been erratic (see section 2.2). During the last few years, several national and regional calls have been delayed (e.g. Promotion of R&I towards societal challenges and the Ramón y Cajal programme) or cancelled (e.g. JAE-doc). Other aspects, such as the non-execution of yearly public national budgets of percentages between 21% and 45% (Molero and de No, 2012a; FECYT, 2013a: 31),¹⁰⁴ and the budget crisis suffered by the CSIC in 2013, indicate that the implementation of the policy framework could have been improved.

Partly due to the budget reduction, lack of implementation of ambitious reforms and the lack of implementation of more temporary ones such as, increasing the number of "Ramón y Cajal" contracts or opening more positions through the new type of contracts brought by the LCTI (see section 3.2), the second structural challenge of the national R&I system lies in its limited and unattractive dual labour market for researchers, which has concentrated the negative consequences of the financial crises on young researchers. The market that young researchers currently face is characterised by an increasing temporariness and unemployment that might be causing a brain drain problem due to the limited opportunities available to follow an academic career path in the country (see section 3.2). This makes human resource management the most pressing problem of the Spanish R&I system (ERAC, 2014).

¹⁰³ A recent report on the impact of the crisis on R&I European systems (EC, 2013e) has analysed the trend of several main R&I inputs and outputs in a pre vs. post crisis period, showing that Spain and Greece are the only countries in which all the indicators followed a negative trend in a post-crisis period, despite their positive initial pre-crisis trend. The indicators are BERD, GBAORD, R&D Employment, Patents, Venture Capital and Ease of Access to Loans. All of them, except "ease of access to loans", were positive before the crisis but negative afterwards.

¹⁰⁴ See Footnote 16.

Table 7. Challenges/opportunities identified by OECD (2006), EECTI (2013-2020) and ERAC (2014) evaluation documents.

OECD (2006)	EECTI (2013-2020)	ERAC (2014)
<p>Strengthen science and technology base achieving excellence and critical mass</p> <p>(1) Fragmentation of funding</p> <p>(2) Low accountability and use of financial incentives</p> <p>(3) Lack of mobility and managerial and strategic planning autonomy of research institution</p> <p>Improve support for business R&I</p> <p>(4) Low efficient tax incentives system and lack of efficiency in other recent policies to improve access to seed and start up</p> <p>(5) Low focus on the specific needs of SMEs.</p> <p>Foster industry-science linkages</p> <p>(6) Lack of technology transfer and networking</p> <p>(7) Low cooperation between regions and national government</p> <p>Foster mobility and strengthen human resources for science and technology</p> <p>(8) Lack of mobility</p> <p>(9) Improve career development for young researcher</p> <p>Improve the governance and evaluation of policy and foster policy learning</p> <p>(10) Improve coordination among ministries and regions and improve synergies between policy design and implementation</p> <p>(11) Clarify and simplify number of instruments, improve transparency and reduce administrative burden</p> <p>(12) Involve stakeholders</p> <p>(13) Improve management of public support and quality of policy implementation</p> <p>(14) Improve coordination and strategic planning and policy evaluation and the use of suitable indicators to monitor progress</p>	<p>(1) Low intensity of R&D effort;</p> <p>(2) Low private R&D investments;</p> <p>(3) Lack of instruments for financing private R&D;</p> <p>(4) Lack of venture capital;</p> <p>(5) Regional disparity in R&D;</p> <p>(6) Fragmentation of R&D groups;</p> <p>(7) Lack of public-private collaboration;</p> <p>(8) Inefficient mechanisms for Knowledge transfer;</p> <p>(9) Low R&D activity in traditional sectors and SMEs;</p> <p>(10) Small size and number of enterprises doing R&D activities;</p> <p>(11) Inter-sectorial mobility barriers for scientists;</p> <p>(12) Small survival business rates;</p> <p>(13) Low internationalisation of R&D actors (specially firms);</p> <p>(14) Low rate of firms in medium high sectors.</p>	<p>Public sector</p> <p>(1) Unequal quality and fragmented scientific activity;</p> <p>(2) Lack of flexibility and inadequate incentives;</p> <p>(3) Human resources constrains; other governance problems</p> <p>Private sector</p> <p>(4) Underperformance in business R&D an Innovation;</p> <p>(5) Insufficient attention to wider innovation (non R&D-based innovation)</p> <p>National-Regional</p> <p>(6) Diversity in regional R&D potential and performance;</p> <p>(7) Fragmented business support services and insufficient evidence of effectiveness</p> <p>(8) Large potential but limited use of EU Cohesion funds to support innovation in Spanish Regions</p> <p>(9) Weak coordination mechanism between national and regional strategies</p> <p>(10) Synergies or duplications in smart specialisation strategies</p> <p>Cross-cutting</p> <p>(11) Enhance the critical mass and long term public-private synergies</p> <p>(12) Reinforcement of a monitoring and evaluation system</p>

Source: Own elaboration from challenges and recommendations from these reports. The numbers in the challenges are including ex-post in the case of the OECD (2006) report.

In addition to these more urgent structural challenges, the Spanish R&I system faces other persistent structural challenges in its industrial structure, science and technology base, and in its governance system. These main challenges were identified several years ago (OECD, 2006; EW 2009; EC, 2011a, Heijs, 2012 and Buesa, 2012) and, despite the efforts made, they still remain. For example, challenges identified by the ERAC report (2014) are quite similar to the ones identified in the new EESTI strategy (2013-2020) and by the OECD report (2006) (see Table III for challenges identified by OECD, EESTI and ERAC evaluation documents).

Industrial structure challenges

The Spanish industrial structure is characterised by its significant weight of small and medium-sized firms in low-tech traditional sectors (OECD, 2006; EW, 2011, 2009; EC, 2011a). It lacks sufficient Spanish multinational enterprises with a leading role in creating R&D-related networks (EW, 2012; EC, 2012b; EC, 2013d). Thus, it is not surprising to find low levels of Spanish patenting activity (EC, 2012a and 2010b) and a low innovative culture (COTEC, 2011a).

Science and technology base challenges

The Spanish public R&D system has increased its performance considerably in recent years and positively enabled its human resources capacity (see the above-mentioned levels of international publications and tertiary education). However, in addition to the already-mentioned limited and unattractive labour market for young researchers, the system is also challenged by its fragmentation and lack of flexibility, with low levels of mobility between institutions, countries and sectors (OECD, 2006; EW, 2012, ERAC, 2014), which act as barriers to improving its efficiency. This fragmentation and the lack of flexibility and mobility create inefficiencies and negatively affect the creation of the necessary “critical mass” to keep on improving the level of quality of research outputs¹⁰⁵ and reducing the distance between research and social and economic needs. The fragmentation of the system was mainly caused by the rapid creation and growth of universities without considering the demand (Hernández & Pérez, 2010), and by the dispersion of funding (OECD, 2006). The lack of mobility makes it necessary to improve inter-institutional mobility and reduce the high levels of “endogamy” (Cruz-Castro and Sanz-Menendez, 2011; Cruz-Castro et al., 2006); to facilitate access by foreign researchers and the return of nationals with foreign experience; and to improve public-private cooperation.

Governance challenges

The main policy challenges have been identified as the lack of coordination (regional and ministerial) between research and innovation policies, and insufficient synergies between policy design and implementation (OECD, 2006, ERAC, 2014). Strategies for smart specialisation might help to overcome some of these problems.

¹⁰⁵ Although the levels of research performance (international scientific co-publications per million population) are above the EU average, the impact of research is below this average (for the latest data available of 2009 the scientific publication among the top 10% most cited publications worldwide as a percentage of total scientific publications was 10.4 against 11).

Therefore, in order to increase the level of performance of the national innovation system, the five main weaknesses could be addressed as follows:

- (1) Guarantee a stable budgetary and policy framework for R&I;
- (2) Improve the labour market for young researchers through temporary and long-term measures;
- (3) Incentivise innovation activities tailored according to the industrial structure of the country;
- (4) Improve regional and national coordination; and
- (5) Improve the use of strategic policy management and effective evaluation mechanisms (see Table IV for the five main structural challenges of the national R&I system).

Table 8. Five main structural challenges of the national R&I system

Challenges /opportunities	Policy measures/actions addressing the challenge	Assessment in terms of appropriateness, efficiency and effectiveness
1. FRAGILE AND UNSTABLE GOVERNANCE SYSTEM	The LCTI (2011) includes mechanisms to improve the governance system (see section 2) The EESTI (2013-2020) and PECTI (2013-2016) offer a policy framework to the R&I Spanish system.	Measures envisaged to improve the governance system could be considered as limited as they have failed in providing a sustained and sustainable policy framework. Public Budget cuts in R&I threaten to aggravate existing structural challenges and to set back the progress achieved in previous years. The high levels of non-executed budget and the increasing role of loans diminish the strengths of the R&D system (e.g. international publications). The implementation of the national plan PECTI (2013-2016) can be regarded as erratic, as important delays have been applied to core programmes (e.g. "Promotion of R&I towards societal challenges").
2. LIMITED AND UNATTRACTIVE LABOUR MARKET FOR YOUNG RESEARCHERS	Regulatory measures to correct the public deficit (e.g. Royal Decree-Law 20/2011) have limited staff recruitment and the filling of positions left vacant by retirees in a 10% over the last years. LCTI (2011) measures on human resources (see section 3.2). PECTI programme on human resources (see section 2.2 and 3.2).	Spain has a highly dual labour market with limited actions to flexibilize it and limited actions to establish additional measures have created the most pressing problem of the Spanish R&I system (ERAC, 2014). The implementation of the some new figures envisaged by the LCTI (2011) has been limited (e.g. contracts "for distinguished researchers or scientists of great prestige"), which indicates low efficiency and effectiveness in the implementation of the policy measures aimed at changing the dual market for researchers The size and fluctuation trend on some programmes for human resources have reduced the efficiency and effectiveness of existing measures (e.g. Ramón y Cajal) that could have alleviated the negative consequences of the financial crisis on young researchers. Unemployment levels and some indication of brain-drain problem indicate that some additional measures to address the situation of young researchers could

Challenges /opportunities	Policy measures/actions addressing the challenge	Assessment in terms of appropriateness, efficiency and effectiveness
		have been envisaged.
3.LOW INNOVATIVE INDUSTRIAL STRUCTURE AND INNOVATIVE CULTURE	<p>Some measures have been taken to address this challenge. For example: The role of innovation in policy mix has been increasing (see section 4.2). Creation of a specific programme for Innovation-based public procurement. There is growing orientation towards Public-Private Cooperation (see section 4.2).</p> <p>The new law LCTI (2011), the new EESTI (2013-2020), and PECTI (2013-2016) also address these challenges. The new Entrepreneurship and Internationalisation Support Act (Law 14/2013 aims at improving finance for entrepreneurs and reducing the administrative burden for starting a new business.</p>	<p>The results appear to be positive although more studies on the efficiency of these programmes seem necessary.</p> <p><i>Programmes to foster innovation through public procurement are not still evaluated.</i></p> <p>COTEC reports appear to indicate an increase in the innovative culture of universities and research centres. However, improvement in the curricula of universities and evaluation of innovative activities of researchers appear to be necessary. The new entrepreneurial Support Act might help to overcome these limitations.</p>
4.NATIONAL REGIONAL COORDINATION	<p>Law of Science, Technology and Innovation (LCTI 2011) aimed at improving national and regional coordination through the Council of Science, Technology and Innovation (CPCTI)</p> <p>Research and Innovation Strategies for Smart Specialisation (RIS³)</p>	<p>Despite the efforts, the need for improving national and regional coordination persists.</p> <p>It is not clear whether the smart specialisation strategies will improve synergies between national and regional governance and research systems or will exacerbate current differences. However, strategies have been conceived in a reasonably systematic manner taking the strengths of the regions into consideration.</p>
5. LIMITED USE OF STRATEGIC POLICY MANAGEMENT AND EFFECTIVE EVALUATION MECHANISMS	<p>Law LCTI (2011) EESTI (2013-2020) ANECA ANEP</p>	<p>Despite the agenda set by the policy documents, there are no clear paths towards its implementation (see section 2.7). Evaluation culture is limited as it ranges from a cumbersome fiscal control to a report of the policy instruments implemented without generally taking into account efficiency and ex-ante and ex-post mechanisms</p>

Source: Own elaboration

5.3 Meeting structural challenges

The Spanish policy mix has evolved considerably over the last decade towards a diversified set of instruments aimed at tackling the structural challenges of the system. Most of these changes were based on several analyses of the obstacles and problems of the Spanish innovation system (OECD, 2006; COTEC, 2005). In addition, specific studies helped to elaborate the new EESTI strategy (2013-2020) and PECTI plan (2013-2016). However, these studies are not publicly available. The new strategy and plan follow the efforts of previous plans and strategies (e.g. Ingenio 2010, National Plan for R&D (2008-2011) and the e2i) for: improving innovation and knowledge transfer through the creation of NTBs, university spin-offs and public-private partnership; fostering human capital (e.g. PhD holders in firms); offering extra financial support for R&I (e.g. risk capital and tax incentives); paying attention to societal challenges; and including public procurement as an instrument to promote innovation (see Country Report of Spain 2012 for more details on the evolution of the policy mix, EW, 2014a: 28-30). All these instruments for the promotion of innovation and of knowledge and technology transfer have been included and reinforced in the EESTI strategy (2013-2020), the PECTI plan (2013-2016) and other legislative measures, such as the LCTI law and the Entrepreneurship and Internationalisation Support Act (Law 14/2013) (see section 2.2 and 4). Therefore, diverse types of policy action have been taken in all the main challenging R&I areas as potential solutions or mitigating factors (see section 2.2 and Table IV for recent policy measures across structural challenges). However, the persistence of the challenges (EESTI 2013-2020; ERAC, 2014) might indicate that the policy mix could have been improved in its appropriateness, effectiveness and efficiency in addressing these.

The appropriateness of these instruments and policy actions for addressing these challenges is difficult to assess, due to the limited use of a strategic policy management system and evaluation culture (ERAC, 2014). The need for improving the evaluation system is also recognised by the EESTI strategy (2013-2020), and some progress have been made in improving the policy intelligence system (e.g. ICONO) (see section 2.7). However, the still limited strategic policy planning and evaluation culture hinders the assessment, as well as the evolution of policy actions towards increasing efficiency. There is some indication that the selection of policy actions and instruments to address structural challenges could have been more appropriate. For example, the increasing proportion of non-executed public budgets for R&I (Molero and de No, 2012a; FECYT, 2013a) indicates that there is a need for analysing what instruments and measures are not being sufficiently demanded or used. The limited use of tax incentives, especially by SMEs (see section 2.5.3), also points in this direction. In addition, the scope of some instruments and policy actions appears to be inadequate, considering the size of Spain, in order to address these structural challenges effectively. For example, the number of Ramón y Cajal contracts or contracts “for distinguished researchers or scientists of great prestige” appears to be very small, for a country the size of Spain, to attract a sufficient number of non-Spanish researchers or to offer an alternative to researchers on precarious contracts that have to queue for a permanent position (see section 3.3).

Similarly, the evidence on the efficiency and effectiveness of policy actions in addressing these challenges is limited. Structural challenges require sustained short and long term action. The research policy evaluation culture could be considered as moderately developed and R&D policy evaluations are still not a systematic activity ([CIA4OPM, 2011](#);

Heijs and Martinez, 2011; Eparvier, 2009; ERAC, 2014; Molas-Gallart, 2012). Strategies and plans are increasingly based on evaluation analyses, but the studies are not always publicly available.¹⁰⁶ The National Evaluation and Foresight Agency (ANEP) is in charge of evaluating the scientific-technical quality of proposals seeking public funding. There is, also, a range of evaluation studies carried out by different stakeholders (e.g. CDTI, FECYT, AEVAL¹⁰⁷, Institute for Fiscal Studies or COSCE). Most of them analyse specific instruments or programmes at national level. Additionally, PhD students or researchers conduct other studies using the publicly available databases (see Valadéz et al., 2011; Herrera, 2008; Herrera and Heijs 2007). Most of these studies offer a positive view on the impact of the policy measures and indicate the existence of financial additionalities (Heijs, 2001; Heijs and Buesa, 2007; [Barajas et al., 2009](#); [Huerger et al., 2009](#); Magro, 2011; Saiz-Briones 2009),¹⁰⁸ but some offer a more critical view (e.g. Vega-Jurado et al., 2009 and Heijs and Buesa, 2007).¹⁰⁹ The CDTI, which is in charge of most of the business-oriented instruments, seems to function well, and several internal and external evaluations of its activities have been carried out that prove this (Heijs, 2001, Heijs and Buesa, 2007; [Barajas et al., 2009](#); [Huerger et al., 2009](#)). The impact assessment of the European Framework Programme “[Evaluation of the impact of the FP6 in the RTD Public System in Spain](#)” (MICINN, 2010) shows a positive and major impact on the participants in terms of an increase in R&D funds, cooperation and internationalisation. However, most studies analyse specific isolated aspects or programmes. It is difficult to assess whether this information is used as input for the next funding cycle.¹¹⁰ The most recent and comprehensive peer review evaluation ERAC (2014) calls for an evaluation process better integrated into the policy system, through a generalisation, standardisation and internationalisation of the evaluation practice working at different levels (programmes, institutions, etc.) in order to improve the Spanish R&I system.

In addition, the critical impact of the financial crisis in this system indicates that the policy mix has been somewhat inflexible. It seems that the policy mix has evolved following a dynamic towards a higher diversification, without sufficiently considering whether this

¹⁰⁶ The PECTI mentions the weaknesses of the previous National Plan (p. 6), but does not refer to the analysis from which these weaknesses were identified. It may well be based on the SISE reports, which evaluated the implementation of the National Plans. These reports were carried out on a yearly basis from 2006 to 2010.

¹⁰⁷ For example, the FECYT elaborates the SISE reports that evaluate the implementation of the National Plans. (The report for 2010 is the last year available). The Spanish Agency for Evaluation (AEVAL) carried out the evaluation of Ingenio 2010 (AEVAL, 2008), but no other evaluation on R&D appears to have been carried out.

¹⁰⁸ The study by Saiz-Briones (2009) shows a non-linear relationship between the support intensity (amount of support by sales) and the effect on the R&D expenditure in Spanish firms. Here the effect decreases in the case of very high support intensities.

¹⁰⁹ Vega-Jurado et al. (2009) underpins the idea that firms frequently use the support for public-private cooperation in Spain to obtain additional financial support. Heijs and Buesa (2007) show that regional public support does promote public-private cooperation and that national and European support schemes promote horizontal cooperation. However, in the case of vertical cooperation, the support schemes do not affect the intensity in cooperation in R&D.

¹¹⁰ Documents on these are made publicly available but with quite a delay and do not include any information on the rationale behind the changes. Nonetheless the SISE reports were much more comprehensive, but the last one was published on 2010. For example, at the time of writing this report, data on public R&D expenditure through national public programmes were only publicly available for 2012. A work programme establishing how the funds of the PECTI would be distributed for 2014 was published in December 2014.

diversification was more effective in addressing the challenges than a reduced action, but of a wider scope, would have been. For example, in an environment of budgetary restrictions, it could have been more appropriate to reduce the number of policy measures focusing on the strengths of the system. The new strategy and plan, despite being published in 2013, when the effects of the financial crisis on R&I were evident, did not include any specific measures to address these. The EESTI strategy (2013-2020) identified the financial crisis as a threat (p. 15), but did not envisage any specific measures to address it. Similarly, in addition to the non-execution of important parts of the public R&D budget (Molero and de No, 2012a; FECYT, 2013a), the increasing proportion of public budgets allocated through loans (MINECO, 2013, Molero and de No, 2014c) indicates that budget cuts have been applied without considering the strengths of the R&I system, namely basic research that is mainly funded through subsidies. The high level of international scientific co-publications (EC, 2013a, 2014b) clearly indicates that basic research is one of the strengths of the Spanish R&D system. This kind of research is usually financed through subsidies. Therefore, the concentration of the reductions in non-financial funds (Molero and de No, 2012c, 2013a, 2014c) could negatively affect the areas in which the R&I system was showing the best performance and progress. The Spanish R&I system in recent years has displayed excellent and increasing research performance (basic research). Spanish researchers are publishing with other international peers much more frequently than their European peers (EC, 2014b), increasing the quality of their publications and the level of co-publication with the private sector (EC, 2014b). This indicates that the efforts made on the research input side in the previous period, with increasing public funding between 2002-2008 (see section 2.5), had a positive effect on the research output side and on the linkages with the private sector. These positive trends in the research output are clearly threatened by the negative trend in public R&I funding, especially when considering that the system does not have reasonable alternative sources of funding. As mentioned earlier, research input from the private sector is nearly half of that of the European average and is decreasing. In addition, the delays suffered in launching the main programme for basic R&D (“Promotion of R&I towards societal challenges”) reveals that policy implementation has been unreliable and the strengths of the system have not been considered. The budgetary crisis of the CSIC in 2013 despite their increasing research performance is also worth mentioning. The mobilisation of important research organisations in support of R&D (see Annex ii) indicates a lack of coordination with other stakeholders in the implementation of policy measures. Finally, budget reduction, lack of implementation of ambitious reforms and the implementation of more temporary ones, together with the increasing levels of temporariness, unemployment and a probable brain drain problem, all make the need for restoring the career path for young researchers and the need to improve the human resource management the most pressing challenges of the Spanish R&I system (ERAC, 2014). Therefore it could be argued that the policy mix has lacked flexibility, as well as ambition and consensus building among stakeholders, to at least alleviate the negative consequences of the financial crisis in R&I. The current situation demands a more active role from the governance system in order to: (1) promote R&D funding and activities; (2) implement measures that could have produced greater efficiency with similar levels of investments, to address systemic challenges; (3) implement alternative methods to alleviate the negative consequences of the financial crisis; (4) prioritise instruments and programmes according to the strengths of the system and reward performance. Most of these measures could have been applied in a favourable

environment. The lack of implementation of these measures in a difficult environment, have definitely weakened the R&I system.

Annex 1 – Grassroots movement in support of science

The institutional and grassroots public demonstrations in support of science were triggered by the important public budget reductions for R&I in 2012. The campaign for “A tick box in the tax declaration” (“Casilla en apoyo de la ciencia en la declaración de la Renta”), the “Open letter for Science in Spain”, followed by the communication “No future without R&D and Innovation” and the simultaneous support actions of 19th December 2012 were probably the most significant ones (see Country Report for Spain 2012 (EW, 2013) for more details). In 2013, public mobilisations continued due to the delay in launching important R&D calls and the budget crises suffered by the CSIC. These actions denounced the severe public budget cuts on R&D and innovation as making R&D and innovation unsustainable and reducing the opportunities to improve the Spanish economy.

On the 21st May 2013 the Group Open Letter for Science (“Colectivo carta abierta por la ciencia”) launched an open call for signatures in support for the second letter for the science “[Let’s save the Spanish R&D and innovation](#)”. The group is composed by different research-related organisations – the Spanish Confederation of Scientific Societies ([COSCE](#)), the Spanish Conference of University Rectors ([CRUE](#)), the Platform for Dignifying Research ([PDI](#)), the Spanish Federation of Young Researchers ([FJI](#)) and the National Association of Ramón y Cajal Researchers ([ANIRC](#)) – and the trade unions Confederation of Worker’s Commissions ([CCOO](#)) and General Union for Workers ([UGT](#)). The letter denounced the worsening situation of the Spanish R&D and innovation system and proposed a list of nine demands to the government. This letter gathered more than 80,000 signatures through an [on-line petition](#).

On the 14th June 2013 there was a new call for simultaneous public demonstrations in support of research and innovation (“[Convocatoria 14J](#)”). The call managed to gather the biggest demonstration of scientist in Spain and was followed in different cities of Spain and in foreign countries and had an important media impact.

On the 30th July 2013 there was a [new call for signatures](#) in support of increasing funding for the CSIC that suffered a major budget crisis. The call gathered about 280,000 signatures. With the same purpose, more than 100 institute directors signed a [letter](#) addressed to the State Secretary of Research Development and Innovation.

On the 27th of September 2013 coinciding with the “[Researchers’ Night](#)” and the debate on the Spanish Congress of the PGE there was another call for [public demonstration](#) in support of science.

As a result of the meetings of the groups with different political parties, on the 19th December 2013, all political parties with representatives in the Congress, with the exception of the Popular Party, currently in the government, [signed an agreement in support of the R&D and Innovation](#). This agreement denounces the decreasing public investments in R&D and states the following four points to guarantee a stable policy support for R&D and Innovation: (1) to ensure a sustained levels funding on R&D similar to the Eurozone average; (2) to remove the regulatory measures that limit the recruitment of researchers in the public sector (Royal Decree-Law 20/2011) and to increase the levels R&D personnel per inhabitant; (3) to ensure the adequate implementation of the policy

objectives and measures envisaged in the PECTI, by guarantying a predictable time-line; and (4) to create the Spanish Research Agency envisaged in the LCTI (2011).

Annex 2

Table 9. Equivalences between New State Plan for Scientific and Technical Research and Innovation (PECTI) (2013-2016) and Spanish National Plan for R&I (2008-2011) (NP)

New State Plan for Scientific and Technical Research and Innovation (PECTI) (2013-2016)	Spanish National Plan for R&I (2008-2011) (NP)
Recognition and promotion of talent and employability Programme	(IWL) Human Resources
Sub-programme of Education and training	Education and training programme
Sub-programme of Employability	Employability programme
Sub-programme of Mobility	Mobility programme
Promotion of excellence Programme	(IWL) R&I Projects
Sub-programme for knowledge generation	Sub-programme of basic research
Sub-programme of Institutional empowerment	(IWL) Institutional reinforcement; (IWL) Use of knowledge and technology transfer; (IWL) Articulation and internalisation of the system; Program of Science and Innovation Culture
Sub-programme for scientific and technological infrastructures	(IWL) Scientific and technological infrastructure
Business leadership programme	Sub-programme of applied research
Sub-programme for private R&I	Sub-programme of technological development (IWL) Articulation and internationalisation of the system; (IWL) Internationalisation;
Sub-programme of enabling technologies	Innovation projects
Sub-programme of collaborative R&I	Networks and public private collaborations
Promotion of R&I towards societal challenges	Sub-programmes Public-private collaboration; INNPACTO; Basic Research; INIA; applied research; development;(IWL) internationalisation of R&D;(IWL) Use of knowledge and technology transfer
Challenges and actions	
Strategic Action in Health	
Strategic Action digital economy and society	

Annex 3

NEW LAW OF SCIENCE, TECHNOLOGY AND INNOVATION (LCTI)

The new Law of Science, Technology and Innovation (LCTI) (1st June 2011) replaced the so-called Law of Science of 1986. The new law aims to improve coordination with regional and European authorities, to take into account the growth of the Spanish R&D and innovation system, to improve research careers and to help the transition to an economy based on knowledge and innovation. It also mentions gender issues and ethics. The emphasis on innovation, which was missing in the Law of 1986, the design of several mechanisms aimed at improving national and regional coordination, and the project of the Spanish Research Agency are the main relevant aspects of the new Law. It modifies the governance and human resources for R&D and improves the mechanisms for the transference of knowledge.

Governance of the R&D and innovation system

The LCTI organises the governance of the R&D and innovation system as follows. The Ministry of Science and Innovation (MICINN) now – the Ministry of Economy and Competitiveness (MINECO) – is responsible for drafting and managing the R&D and innovation strategies and plans proposals. The LCTI envisaged two strategies and two plans that have recently merged into single documents.

- The Spanish Strategy for Science and Technology and Innovation (EECTI) (2013-2020) is a multiannual plan that sets the rationale, objectives and indicators of the Spanish R&D and innovation policy (see below a specific section for this document).
- The Spanish State Plan of Scientific and Technical Research and Innovation (PECTI) (2013-2016) is a multiannual plan that implements the EECTI by setting its priorities, programmes, coordination mechanisms, costs and sources of funding.

Both documents were approved on 1st February 2013 (see the specific section for this document).

The Executive Committee for Science, Technology and Innovation policy (CDCTI) is an inter-ministerial body responsible for the planning, evaluation and coordination of the main Spanish instruments for R&D and innovation.

Two main consultative bodies support the design and implementation of the R&D innovation strategies and plans:

- Council of Science, Technology and Innovation (CPCTI) – in charge of coordination with regional governments and other actors in the R&D system. It also supports the drafting of the national strategies. Its members are the Secretaries of State of the Ministries with R&D and innovation responsibilities and representatives of each of the regional governments “Comunidades Autónomas”. It replaces the General Council of Science & Technology (GSCT).

- Advisory Council of Science, Technology and Innovation (CACTI) in which the research community, enterprises and trade unions are represented. It reports on the strategies and plans and offers information, suggestions and opinions. It replaces the Advisory Council for Science and Technology Policy (ACSI).

The Ministry, in collaboration with other ministries, drafts the R&D and innovation plans. The CDCT and CACTI report on the drafts before these are subjected to the approval of the Government.

The LCTI 2011 envisages the creation of the Spanish Research Agency (to be created). This Agency aims to be an autonomous entity that will assign R&D funds on grounds of scientific merit. The draft of the General State Budget (PGE) of 2012 forbade the creation of any public agency, making it necessary to include an amendment to allow the creation of the Research Agency. The LCTI does not include specific details about the structure and responsibilities of this agency, which will be, together with the Centre for Industrial Development (CDTI), the main funding bodies of the R&D and innovation system. It is assumed that the Agency will be responsible for the research-oriented projects whereas the CDTI will manage policy instruments oriented towards the enterprises. Other organisations, such as the Carlos III Health Institute, also fund research.

The Information System of Science, Technology and Innovation (SICTI) is responsible for the data collection and analysis for the monitoring of all policy programmes and instruments of the R&D and innovation policy. The system aims to gather information coming from national and regional actors (the National State Administration – AGE – and the Regional Administrations – “Comunidades Autónomas”). The system is under the umbrella of the MINECO and the Council of Science, Technology and Innovation (CPCTI). The LCTI emphasises the coordination between national and regional information systems through the SICTI and the CPCTI.

The Committee of Ethics in Research is an advisory body on the ethics of research and technology.

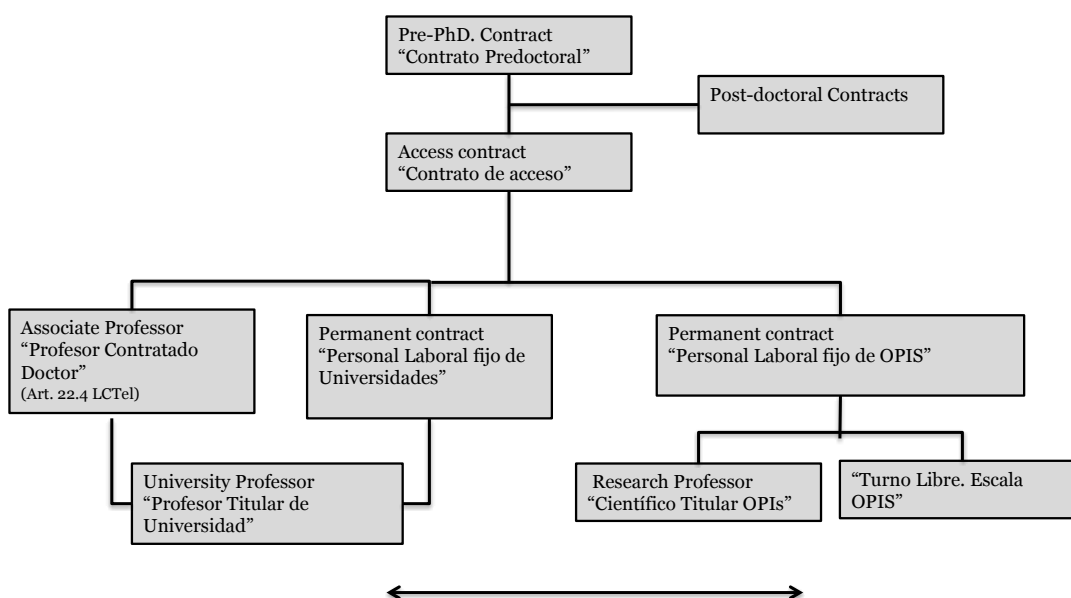
The design of several mechanisms aimed at improving national and regional coordination, such as the Council of Science, Technology and Innovation (CPCTI) and the new information system (SICTI), as well as the project of the Spanish Research Agency are the main changes in the governance of the R&D and innovation system brought by the new law. Figure 1 shows the structure of the Spanish research and innovation system and Table i summarises some of the main organizational changes and equivalences between the new and previous Spanish R&D and innovation system.

Human Resources

The LCTI includes four types of private (non-civil servant) labour contracts: (1) to carry out a PhD degree (four years maximum with minimum wages) (Art. 21); (2) of access (five years and maximum of 80 hours of teaching) (Art. 22); (3) for researchers working on research projects (D.a 23a); and (4) for distinguished researchers or scientists, “of great prestige” who will be able to occupy key positions in management or in “important” programmes (which can be permanent) (Art.23). The pre-PhD contract will be delayed till 2014 and the access ones could be conditioned by the State budget and public employment supply. Moreover, it has created a unified professional career. The different official professional scales for scientists with a civil servant status in public research organisations (PROs) will be unified in three, comparable to those of the Spanish National Scientific Research Council (CSIC): (1) research professor, (2) scientific researcher and (3) permanent scientist. This unification facilitates staff mobility between the PROs (see Figure 2 below).

The LCTI also improves several aspects in the career of the researchers. The future replacement of the 2+2 system (two years scholarship and then a two year contract) by a four-year employment contract implies the full recognition of certain rights such as unemployment benefits and maternity leave. In addition, the LCTI improves mobility between private and public organisations by allowing an extended leave for a maximum of 5 years and reducing partially the incompatibility for working in private firms (see section below).

Figure 2. Scheme of a research career



Source: MINECO

Mechanisms for knowledge transfer

The LCTI emphasises the role of innovation, technology and knowledge transfer by improving the mechanisms of knowledge transfer, granting property rights to researchers and reducing the incompatibility for researchers employed at public institutions to work in private firms. It aims at improving mechanisms of knowledge transfer by: (1) increasing the value of transfer activities (e.g. by detecting research groups whose knowledge could be applied or by increasing the role of OTRIs) (2) promoting the “units of excellence” (art. 33.1) or (3) developing an open-access archive with research results. It encourages the creation of Technology Based Enterprises (EBTs) by allowing researchers to work part-time in private firms created by the organisations in which they are working and by eliminating restrictions on the maximum share ownership of a private company (10%) and the restrictions on being a board member in private companies. It modifies the previous Law of Sustainable Economy (Law 2/2011) to allow researchers to profit from their patent earnings.

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Abbreviations

AEVAL	Spanish Agency for Evaluation	Agencia de Evaluación y Calidad
AGE	National State Administration	Administración General del Estado
ANEP	National Evaluation and Foresight Agency	Agencia Nacional de Evaluación y Prospectiva
ANIRC	National Association of Ramón y Cajal Researchers	Asociación Nacional de Investigadores Ramón y Cajal
BERD	Business R&D Expenditures	
CACTI	Advisory Council of Science, technology and Innovation	Consejo Asesor de Ciencia, Tecnología e innovación
CDCTI	Executive Committee for Science, Technology and Innovation policy	Comisión Delegada del Gobierno para Política Científica, Tecnológica y de Innovación
CDTI	Centre for Industrial Development	Centro para el desarrollo tecnológico Industrial
CPCTI	Council of Science, Technology and Innovation	Consejo de Política Científica, Tecnológica y de Innovación
COSCE	Spanish Confederation of Scientific Societies	Confederación de Sociedades Científicas de España
CRUE	Spanish Conference of University Rectors	Conferencia de Rectores de las Universidades Españolas
CSIC	Spanish National Research Council	Consejo Superior de Investigaciones Científicas
EBTs	Technology based enterprises	Empresas de base tecnológica
ENCYT	National Strategy for Science and Technology	Estrategia Nacional de Ciencia y Tecnología
EECT	Spanish Strategy for Science and Technology	Estrategia Española de Ciencia y Tecnología (before ENCYT)
EEl -e2i	Spanish Strategy for Innovation	Estrategia Española de Innovación
EESTI	Spanish Strategy for Science, Technology and Innovation	Estrategia Española de Ciencia y Tecnología y de Innovación
ERAC	European Research and Innovation Area Committee	
EU	European Union	
EW	Erawatch	
FECYT	Spanish Foundation for Science and Technology	Fundación Española para la Ciencia y la Tecnología
FEDIT	Spanish Federation of Technology Centres	Federación Española de Centros Tecnológicos
FJI	Spanish Federation of Young Researchers	Federación de Jóvenes Investigadores
FTE	Full-Time Equivalent	
GBAORD	Government Budget Appropriations or Outlays on R&D	
GDP	Gross Domestic Product	
GERD	Gross Expenditure on Research and Development	
GSTC	General Council of Science & Technology	
HEIs	Higher Education Institutions	
ICONO	Spanish Observatory of R&D	Observatorio Español de I+D+i
INE	Spanish Institute of Statistics	Instituto Nacional de Estadística
ISCIII	Carlos III Health Institute	Instituto de Salud Carlos III
IWL	Instrumental Working line	Líneas instrumentales de Actuación
LCTI	Law of Science, Technology and Innovation	Ley de Ciencia, Tecnología e Innovación
MEC	Ministry of Education	Ministerio de Educación
MEDU	Ministry of Education, Culture and Sports	Ministerio de Educación Cultura y Deporte
MICINN	Ministry of Science and Innovation	Ministerio de Ciencia e Innovación
MINECO	Ministry of Economy and Competitiveness (before MICINN)	Ministerio de Economía y Competitividad
MINETUR	Ministry of Industry, Energy and Tourism	Ministerio de Industria Energía y Turismo
MITYC	Ministry of Industry, Tourism and Commerce	Ministerio de Industria, Turismo y Comercio
NP	Spanish National Plan for R&D and Innovation Plan	Nacional de Investigación Científica, Desarrollo e Innovación Tecnológica
Np	National programmes	Programas nacionales
OPIs	Public Research Bodies	Organismos Públicos de Investigación
PROs	Public Research Organisations	
PECT	Spanish National Plan for Scientific and Technical Research	Plan Estatal de Investigación científica y técnica (before NP)
PECTI	Spanish State Plan of Scientific and Technical Research and Innovation (2013-2016) (It merges the envisaged PECT and PEI)	Plan Estatal de Investigación Científica y Técnica
PDI	Platform for Dignifying Research	Plataforma por una Investigación Digna
PEI	Spanish National Plan for Innovation	Plan Estatal de Innovación

PGE	Central Government Budget	Presupuestos Generales del Estado
RIS3	Research and Innovation Strategies for Smart Specialisation	
R&D	Research and Development	
SICTI	Information System of Science, Technology and Innovation	Sistema de información sobre ciencia, Tecnología e innovación
SGCTI	General Secretariat of Science, Technology and Innovation	Secretaría General de Ciencia, Tecnología e Innovación
SMEs	Small and Medium Enterprises	
SSRDI	State Secretary of Research, Development and Innovation	Secretaría de Estado de Investigación, Desarrollo e Innovación

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